VOL. XXVII NEW YORK—THURSDAY, OCTOBER 24, 1912—CHICAGO No. 16

The AUTOMOBILE

Motors Invade Agricultural Realm

Case steam tractor in French agricultural trials plowing at a cost of 52 cents per acre. This tractor led in the tests, doing better and cheaper work than its rivals

MOTOR PLOWING COSTS

CASE
52 cents per acre

DE MESMAY
74 cents per acre

LEFEBVRE
$1.16 per acre

BAJAC
$1.20 per acre

FILTZ
$1.22 per acre

INTERNATIONAL HARVESTER
$1.50 per acre

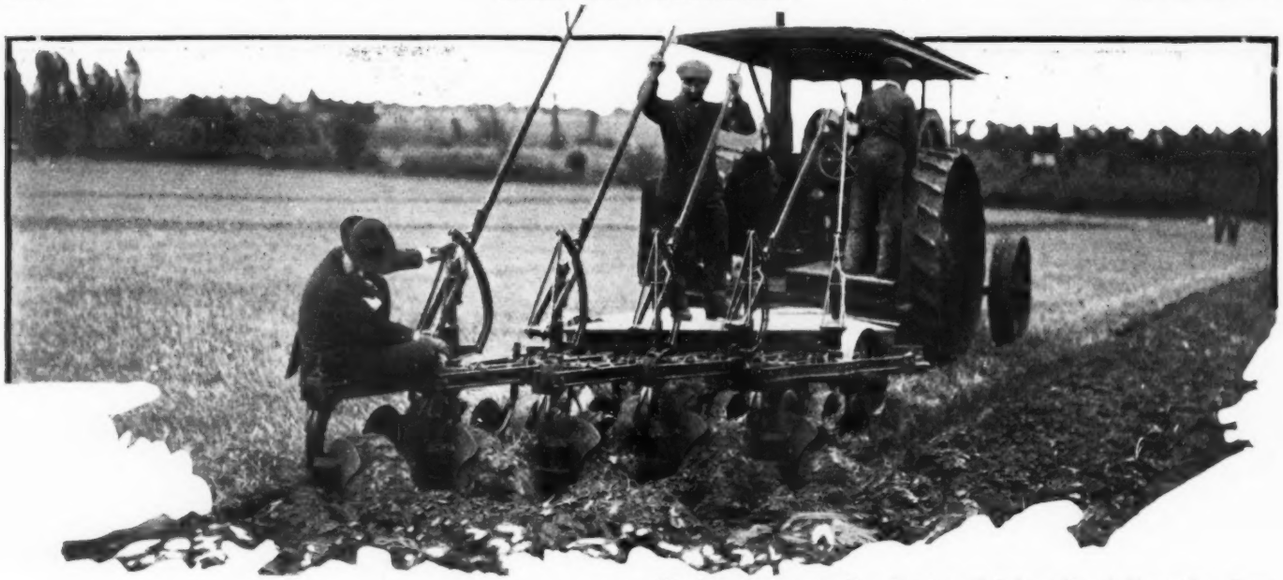
VERMOND & QUELLENNEC
$2.62 per acre

GILBERT
$5.20 per acre

BOURGES, France, Oct. 7—France and America have just competed in the most important plowing competition held in this country, in which honors were very evenly divided. The event, put on foot by the Central Automobile Club, with the assistance of the Agricultural Commission of the Automobile Club of France, united twelve machines of widely different types, nine machines taking part in the practical tests. The competition was decided on the amount of plowing done, the depth attained, ease of operation, fuel cost and freedom from breakdowns. Owing, however to the machines varying enormously in original cost, amount of work they were able to perform and number of men required to handle them, it was a difficult matter to class them in order of merit. The demonstration they gave was the most valuable yet seen in France.

On the first day the ground was bad, having a stony subsoil into which the plows stuck as soon as they attempted to reach a reasonable depth. On the second day the ground was heavy, but with a much greater depth of soil. The third day, which should have been devoted to deep plowing, was changed into a demonstration, for it was found that the ground, which had been offered by a local farmer, was so bad that no machines cared to tackle it on a competitive basis. It afterwards transpired that having very great difficulty in plowing this land to any depth by the use of horses or oxen, the farmer had conceived the idea of letting the motor machines work on it, but had neglected to state its particularly difficult nature to the committee. The ground was not uniform; thus the weak machines withdrew altogether, and the more competent appliances were held back on the ground that if they got a bad patch an unfavorable impression would be created among the public. The cost figures are considered the most authentic which have been obtained to date in such competitions.

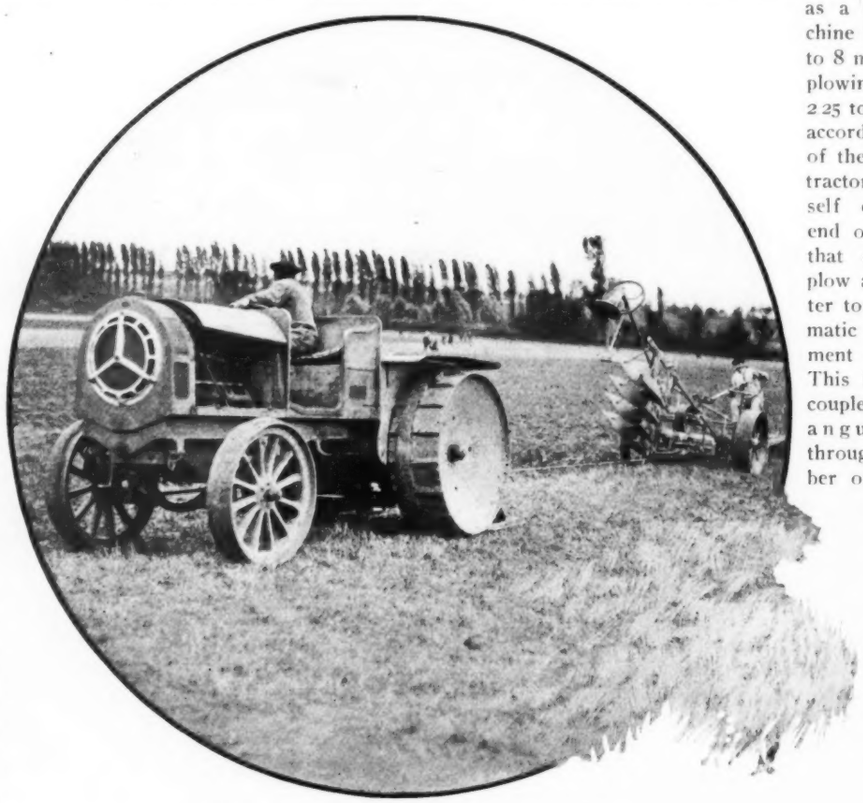
Considered from a fuel cost basis only, the most successful machine was the J. I. Case Company's steam tractor, which worked at the rate of 52 cents per acre, using compressed coal bricks of the type commonly employed on the French railroads.



Single-cylinder gasoline tractor of International Harvester Company plowing at $1.50 per acre

This was the only steamer in the competition, all the others being of the internal combustion type and all but one running on benzol. As an offset against the low price of the Case steamer must be set the fact that it employed three men, while practically all the other machines worked with either one or two operatives. The next in order of merit on a cost basis was the De Mesmay at 74 cents per acre. There was no comparison, however, between this machine and the American, for while the latter did deep plowing, and a large amount of it, the French appliance was really only a motor hoe which, with a two-blade plow attached, did a mere surface plowing. Very closely placed after these two were the Lefebvre caterpillar type plow at $1.16 per acre, the Bajac at $1.20, the Filtz at $1.22 and the International Harvester Company's machine at $1.50. All these did really satisfactory work, but with so many other factors to consider, it would not be equitable to judge of their value on a fuel cost only. The remainder cannot be considered very practical machines, for the fuel cost varied from $2.62 for the rotary Vermond & Quellennec to $5.20 for the small Gilbert.

The two American machines were the respective firm's standard models, the Case being the company's 30-horsepower steam tractor hauling a platform with eight plows, and the International Harvester machine being the 25-horsepower single-cylinder gasoline tractor working with five plows. Compared with the Americans the French machines were designed for work on small areas, they were more complicated and better finished.



Bajac drum type plowing at $1.20 per acre

Bajac, Lefebvre and Filtz gave about equally good results, although representing three entirely different types of machines. The Bajac, which is built by the Bajac Company in conjunction with the De Dion Bouton Company, is a tractor with a winding drum having a sufficient length of cable to haul a plow across a field about 100 yards in length. The tractor carries its motor, a four-cylinder of 35 horsepower, identical with those used on the Paris omnibuses, forward under a bonnet, transmits through a clutch and a propeller shaft to a combined gearbox and differential housing, and takes final drive by transverse shafts having pinions meshing with internal gears on the large diameter road wheels. The propeller shaft is continued rearwards and drives a vertical shaft on which is the winding drum. Used as a tractor, the machine has a speed of 6 to 8 miles an hour; its plowing speed is from 2.25 to 3 miles an hour, according to the nature of the ground. As the tractor has to place itself on the opposite end of the ground to that occupied by the plow and haul this latter to it, a quick automatic locking arrangement is necessary. This is obtained by a couple of stout triangular frames through the base member of which projects a stout steel prod. Suspended at the rear, these two frames can be raised and lowered by means of a winding drum operated by the driver, and when lowered one of the sides of the

De Mesmay gasoline motor hoe worked at a cost of 74 cents per acre in the tests

triangle is in contact with the road wheel and another is on the ground. By backing a short distance the prod is forced into the ground and the greater the strain on the cable the more tightly the rear wheels are wedged. A certain amount of time is naturally lost in running backwards and forwards on the field, but the losses are reduced to the minimum by the automatic locking device. The machine requires the services of two men, one operating the tractor and the other working the balanced plow.

The Lefebvre is a direct hauler, being a three-wheel tractor to which a balanced plow is attached. The motor is in front under a bonnet, and the single steering wheel is controlled by means of an inclined steering column with worm and sector. The machine is distinctive by reason of a caterpillar device for securing traction on soft ground. Normally, when running on roads the drive is through to the rear wheels, but when plowing the machine hauls itself along by means of a couple of endless bands, each one surrounding a heavy roller chain and having projecting blades or paddles. On the jackshaft, carried behind the rear axle, there are two chain sprockets, one transmitting the drive to the live axle and the other, only brought into use when plowing, carrying the power to a large chain sprocket on each side of the tractor. The tractor is provided with an external trussed frame, the fore end of which can be raised or lowered by a worm and screw belt driven off the motor; at the front end of this frame is a sprocket of the same diameter as the rear one, and a chain surrounding the two. Around the chain, and attached to it, is a broad leather band carrying the projecting blades already mentioned. The front end of the frame being lowered the blades enter the ground and by the rotation of the chains drive the machine ahead.

Vermond & Quellennec rotary worked at $2.62 per acre

The Filtz machine is a four-wheel bogey carrying a 25-horsepower gasoline motor under a bonnet, having the driver's seat in the center and the radiator at the extreme rear. Through a cone clutch the power is transmitted to a propeller shaft, a pinion on the extremity of which engages with a crown bevel gear on a transverse shaft. There are two crown wheels on this shaft with an arrangement for bringing either one of the other into engagement with the driving pinion. On one end of the jackshaft is mounted a grooved pulley, outside the frame member, and there is a second and similar idler pulley also outside the frame member. A fixed cable rigidly attached to each extremity of the land to be plowed is given four or five turns round these two pulleys and according to which pinion is in engagement the machine will haul itself and its plow across the field in either direction. The tractor is light and simple, but it is not self-propelling. Three men are required, one being on the tractor and one at each end of the field to maintain the tension on the cable and haul the bogey to which the extremities of the cable are attached. This bogey has disk wheels and a couple of winding drums with ratchets, one being for the

The Lefebvre caterpillar worked at a cost of $1.16 per acre in French tests

plowing cable and the other to haul the bogey along the field as the furrows are traced.

Three different types of rotary plows were presented, but not one of them went completely through the 2-days test. The Motoculture Française, the lightest and simplest of the three, carries a three-cylinder gasoline motor set across the frame, with single chain drive to the road wheel and a second chain drive from the rear axle to a second shaft having 100 flexible hooks mounted on it. Both chains are inclosed and a device is provided for raising or lowering the shaft carrying the plows. The distinctiveness of the apparatus lies in the fact that the ground is turned up by a set of flexible, spring-mounted hooks, rather than picks, of such a nature that they will bend if brought in contact with a hard object. The plowing rate of the machine is very slow, being less than half a mile an hour, working on a width of 78 inches. The machine might be suitable for soft ground, but was defective in heavy and stony earth. When it got on to the heavy clay soil of the second day it was unable to obtain traction. The motor, too, was underpowered, the engine continually overheating.

There were two Vermond & Quellennec machines, similar in principle but differing considerably in construction. Only one actually plowed, the other being held up first by mechanical troubles, then by reason of its inability to get over the soft ground to the field. The more successful of the two has a Schneider four-cylinder motor of about 4 by 5 inches, similar to the motors used on the Schneider buses in Paris. It drives the rear wheels through a clutch, gearset and jackshaft meshing with an internal gear on the rear wheels. In addition a second jackshaft is driven off the rear extension of the propeller shaft and carries a sprocket at each end from which the power is taken to the pick shaft by means of chains. The plowing in this case is done by very heavy, rigid picks, ninety-nine in number, mounted on the rear shaft. The speed is under a mile an hour for a width of 66 inches, and, although the depth attained is fairly satisfactory, with the 35 horsepower available, the machine cannot be considered a success, for the motor was constantly overdriven, was overheating and was frequently on the point of being stalled.

The De Mesmay and Gilbert machines are only of value for small work. They have very little power, the former having a single-cylinder motor, which is really only designed to work a motor hoe, and the latter having a twin-cylinder motor driving a single wheel and obtaining its traction by reason of a series of eccentrically mounted blades projecting through slots in the rim of the wheel. This mechanism gave trouble, and deprived of its blades the machine was unable to get sufficient traction.

The plowing was watched by a large number of farmers and also by an official delegation from the Paris municipality interested in motor plowing for the city's sewage farm. Conditions were arduous, but real work was done and orders were placed for motor plows. Both the Case and the International Harvester companies report that several of their plows are now working on French farms.

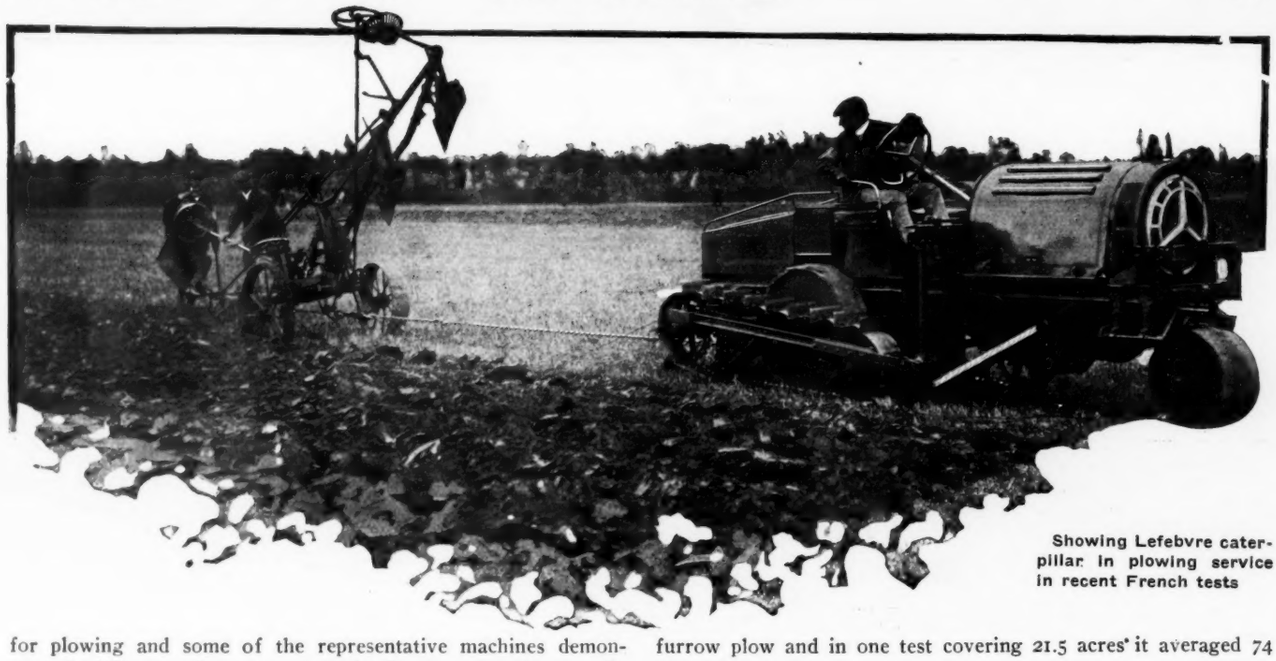
At the Winnipeg agricultural show organized by the Royal Agricultural Society of England a large number of agricultural tractors equipped with motors rated between 8 horsepower and 105 were recently exhibited and offer some figures for comparison.

The tractors haul from four to twenty plowshares when used

PLOWING COMPETITION FOR MOTOR AND STEAM DRIVEN

Machine		Width Land Plowed	Speed in m.p.h.	Depth in Inches	Area Plowed Acres
International Harvester Co.	1st day	74 in. 5 plows	2.2	6 to 8.2 aver. 7	3.7
	2nd day		2.6	7 to 9.4 aver. 8.2	2.5
Bajac	1st day	58 in. 4 plows	2.9*	4 to 6.6 aver. 5.6	3.6
	2nd day		2.2	5.2 to 6 aver. 5.6	2.2
Lefebvre	1st day	31 in. 3 plows	2.5	6 to 8.2 aver. 7	3.9
	2nd day		2.1	7 to 9.4 aver. 8.2	2.3
Filtz	1st day	27.5 in. 4 plows	2.8	4 to 5.6 aver. 4.8	1.1
	2nd day		2.9	5.6 to 7 aver. 6.3	2.0
Motoculture Française	1st day	78 in. 100 hooks	0.39	2.7 to 6.2 aver. 4	1.03
	2nd day			4.4 to 4.8 aver. 4.7	0.29
Vermond & Quellennec	1st day	66 in. 99 picks	0.86	4 to 7.4 aver. 5.2	1.8
	2nd day			6 to 7 aver. 6.3	0.71
Gilbert	1st day	19.5 in. 2 plows	1.6	2.4 to 4.7 aver. 3.2	
	2nd day		1.7	2 to 2.3 aver. 2.1	
De Mesmay	1st day	19.5 in. 2 plows	0.31	Surface plowing	4.4
	2nd day				4.0
Case Steamer	1st day	88 in. 6 or 8 plows	2.6	5.2 to 7 aver. 6.2	4.4
	2nd day		2.2	5.5 to 7.4 aver. 6.3	4.0

*Speed of tractor only 6 to 8 miles an hour. †Benzol at 30 cent



Showing Lefebvre caterpillar in plowing service in recent French tests

for plowing and some of the representative machines demonstrated ability to plow ground at $1.38 per acre. Among the exhibits was a Daimler tractor rated at 36 horsepower for which figures of cost in this variety of work were submitted. The figures showed that using gasoline as fuel the daily cost of operation, including every possible expense and working 10 acres a day, was $10.72, which would make the per acre cost $1.07.

Using kerosene the cost was reduced to $8.94 per day, or 89 cents per acre.

Conditions of actual service differ so widely one from another that any absolute standard of efficiency is impossible to reach.

One of the smaller tractors shown at Winnipeg used a six-furrow plow and in one test covering 21.5 acres it averaged 74 cents an acre.

An Ivel three-wheel tractor attracted much attention at the show. In a recent English test it was reported that a tractor of the same model using kerosene for fuel and equipped with two plowshares worked 6 acres of land in 9 hours at a cost of $5.55, or 92.5 cents an acre.

The field trials of some of the tractors used for plowing, which were displayed at Winnipeg, were interesting.

Twenty-five tractors entered the competition. The furrows were all gauged at 14 inches apart and the machines pulled all the way from four to ten bottoms. They traveled 6 miles, and the amount of land plowed depended entirely upon the number of plowshares attached to the particular machine. A fair representation of the average work done by tractors of modern type may be seen in the experience of actual users of the machines. One concern using two tractors, one of which was 20 horsepower and the other 35 horsepower, has cultivated 2,000 acres of land by their use.

One test to which this concern put the tractors was breaking up a field of blue grass sod 30 years old. The field was 15 acres in extent and the two tractors drawing plows broke up the whole field in 10 hours to a depth of 6.5 inches. With disk plows it has been found that from 65 to 80 acres a day can be worked. The tractors have two or more speeds and the usual powing speed ranges from 2 to 3 miles an hour.

Fuel cost per acre as shown in a series of tests where five plows were attached to each tractor and the acreage covered ranged from 15 to 18 per day, was in the neighborhood of 42 cents and the total cost, including up-keep, interest and insurance, was 85 cents an acre.

The tractor that performed its task quickest was an Aultman-Taylor using gasoline as fuel. It required 144 minutes to do the 6 miles. The first place as far as acreage covered is concerned went to a big Case tractor, which worked 3.79 acres in the 6-mile trip, but required 20 minutes more time.

The machine making the lowest fuel cost per acre was a Rumely using kerosene. The cost was 33.7 cents per acre. The high cost was made by a big steam tractor, being 66.3 cents per acre plowed.

The average ran around 46 cents, but it should be considered that some of the plows carried as many as twelve bottoms. In the paragraph above where the cost was given as 42 cents per acre only five plows were used.

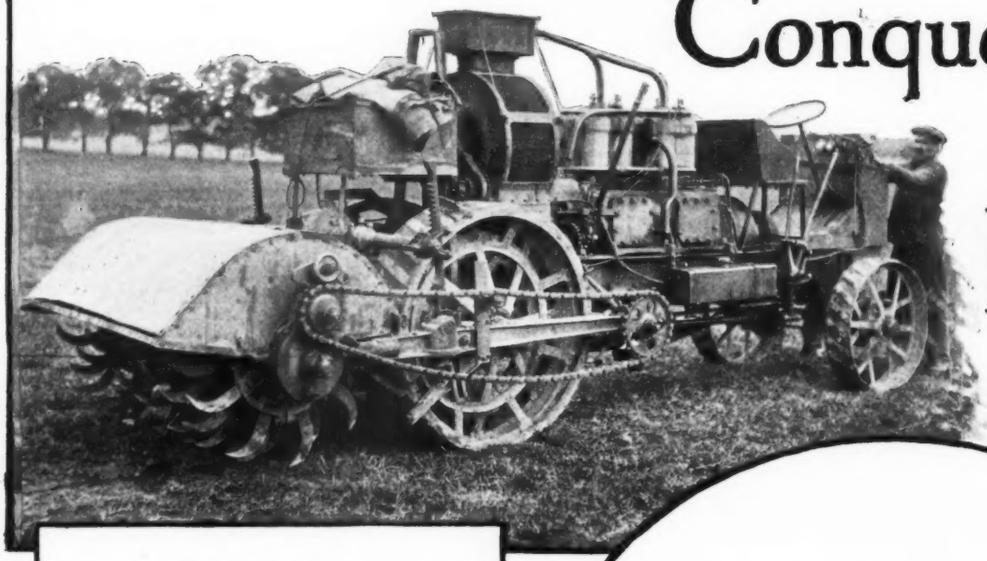
The kerosene tractor entered by the International Harvester Company required 14 minutes to make the turns, while an Avery gasoline tractor made them with a loss of only 5.7 minutes.

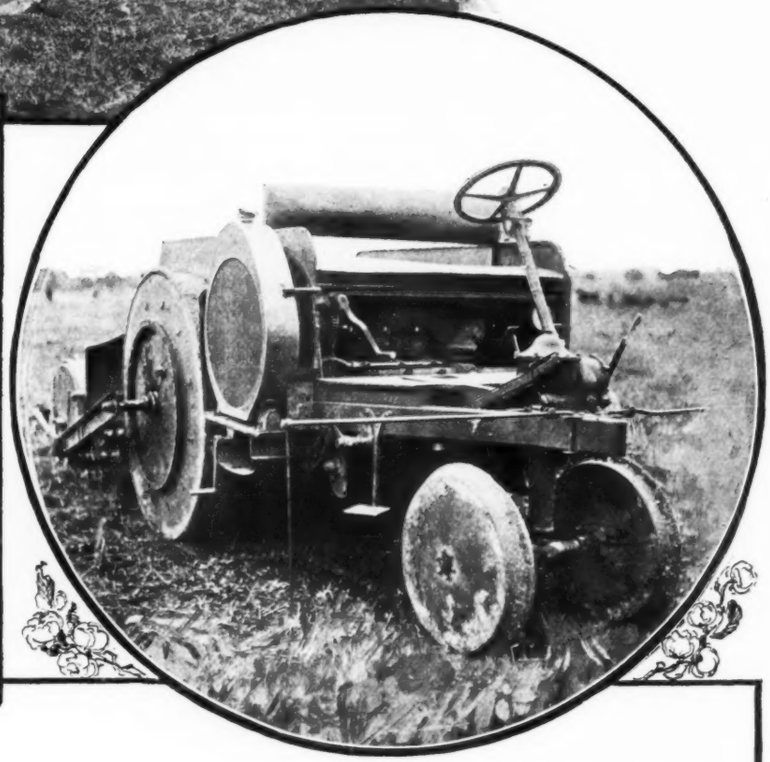
AGRICULTURAL MACHINES AT BOURGES, FRANCE

Men Employed	Fuel Used	Fuel Used, Gals.	Working Time, Hrs. M.	Total Stops, Mins.	Fuel Consumed Per Acre Gals.	Fuel Cost Per Acre†
2	Benzol	11.6 14.3	5:34 2:47	0 25	4.1	$1.50
2	Benzol	11.6 7.8	5:14 3:35	22 20	3.3	$1.20
2 or 4	Benzol	10.4 9.7	4:37 3:54	20 41	3.19	$1.16
3	Benzol	4.4 6.3	4:14 4:13	28 34	3.4	$1.22
	Benzol	10.3	3:45 1:40	0 64	9.91	$3.60
1	Benzol	13.5	5:13	0 Many	7.04	$2.62
2	Gasoline	1.6	0:44 0:58	Many Many	11.4	$5.20
2	Benzol	4.1 1.6	3:20 2:40	28 4		$0.74
3	Coal bricks	947 lbs. 661 lbs.	3:20 2:40	15 0	638 gals. of water 479 gals. of water	$0.52

a gallon; gasoline at 38 cents a gallon; coal at $7.25 per ton.

Conquering the Farm





Top Illustration

Vermond & Quellennec motor plow in operation during the recent agricultural competition, when this equipment plowed at the cost of $2.62 an acre. The V. & Q. plow is driven by a 4 by 5-inch, four-cylinder Schneider motor of the omnibus type, the drive being from the propeller shaft both to the rear wheels and the plowshares arranged on a rotating axle

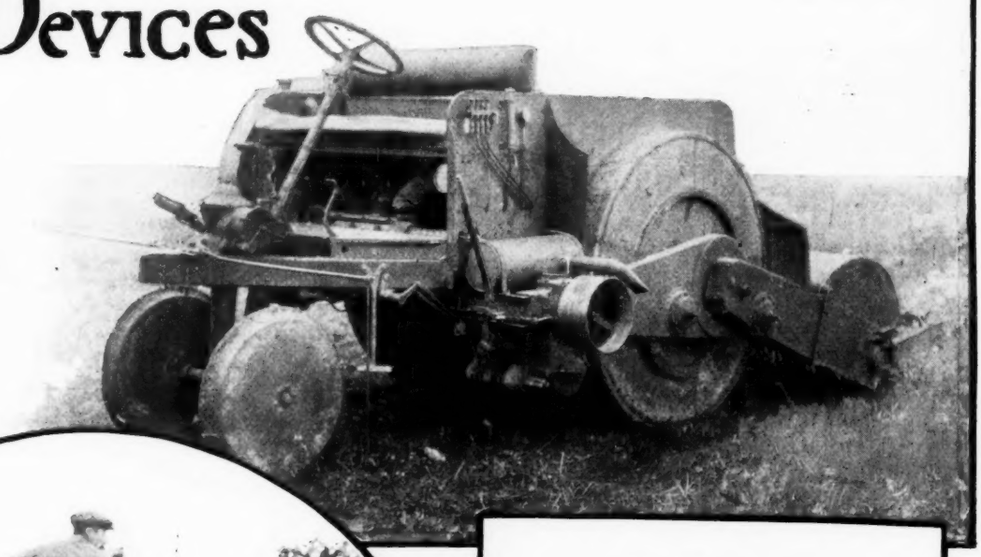
Center Illustration

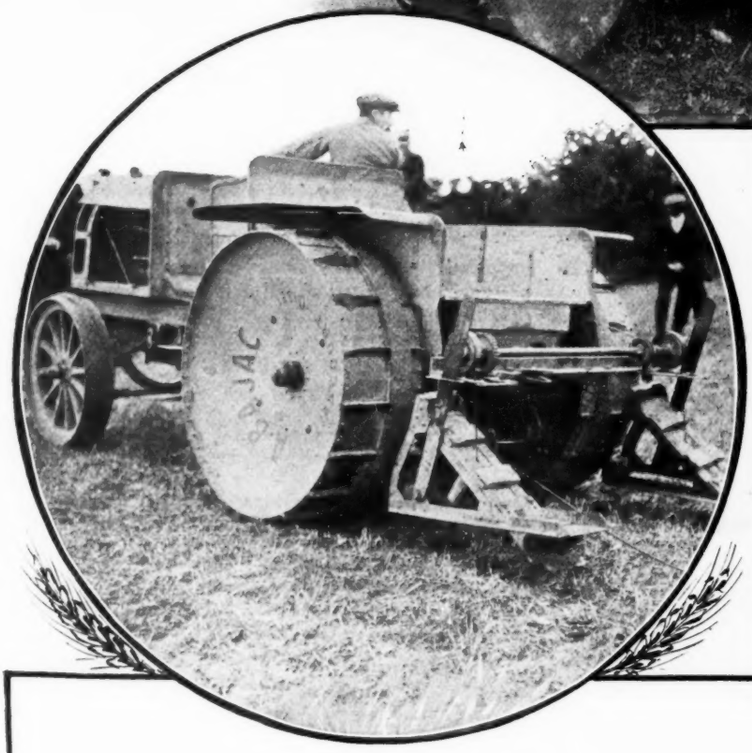
View of the Motorculture Française motor plow which was among the simplest and lightest designs demonstrated. A chain drives the road wheels and another chain the flexible spring mounted hooks which are mounted on a shaft. This type of plow is well suited for soft soil and, due to the use of an engine of low power, works slowly and at $3.60 an acre

Bottom Illustration

A typical scene during the agricultural contest, when crowds of peasants lined the paths of the motor-plows. The farming populace showed great interest in the demonstration of the novel appliances and manufacturers look forward to a lot of business with automobile farming equipment among the French peasantry during the next few years

Motor Devices Show Value





Top Illustration

Another view of the Motorculture Française tractor which, like the majority of equipments, uses benzol for fuel. This illustration shows the left side of the vehicle, illustrating the double chain drive, from the jackshaft to the axle and to the plowshare axle, both chains being incased to shield them from interference with objects on the field

Center Illustration

Tractor built by Bajac and De Dion companies, which is equipped with a 35-horsepower motor, permitting of a traveling speed of 8 miles and of a plowing speed of 3 miles an hour. The winding drum around which the propelling cable is laid is shaft-driven and vertical. The operating cost was $1.20.

Bottom Illustration

Filtz tractor driven by a 25-horsepower engine has a very automobile-like appearance. The drive to the plow mechanism is through a propeller shaft and a bogey, to the ends of which cables are attached which, in turn, are secured to the end of the furrow to be plowed, so that the machine may propel itself across the ground. This machine plowed an acre for $1.22

Peerless Increases Capital

Report Current That $1,500,000 Has Been Secured to Enlarge the Scope of the Company

Outlook Bright for Atlas Motor Car Company—Continental Motor Increases Capital to $2,400,000

ADDITIONAL finances, said to be $1,500,000, to enlarge the scope of the Peerless Motor Car Company, of Cleveland, have been secured, according to indirect reports received in New York this week. President S. J. Kittredge interested J. Robert Crouse, a multimillionaire, of Cleveland, in the project and the funds were obtained without going into the general market. Reports have been current that Kittredge was to retire from active direction of the Peerless affairs in the near future but official denials have followed the spreading of the reports.

The expansion of the truck end of the manufacturing business is given as the main cause for the new financing.

Planning to Renovate Atlas

SPRINGFIELD, MASS., Oct. 21—Attorney Edward W. Beattie, who is acting for the Atlas Motor Car Company, of Springfield, Mass., announces that despite the fact that three more attachments had been placed upon the company's property the outlook for resuming business is much brighter than ever and there is a good prospect that all the financial difficulties of the company will be settled in the near future and the concern reorganized.

At present the entire plant with the exception of the repair department is shut down, but Attorney Beattie states that if the plans under consideration go through it will mean the employment of a larger number of hands than before, when the regular list totaled 140 employees.

Continental Motor Increases Capital

DETROIT, MICH., Oct. 21—At a recent meeting of the directors of the Continental Motor Manufacturing Company the capital stock of the concern was increased from $500,000 to $2,400,000. Of this amount, $900,000 was made preferred stock and $1,500,000 common. The latter will remain in the treasury to take care of present improvements and additions to the plant, as well as to cover any dividends to stockholders. According to President Tobin, the concern is in an exceedingly prosperous condition, the entire output of the large plant being sold up through August, 1913.

Crude Rubber Easier; Price Unchanged

Crude rubber was easier in the world's markets during the past week. Quotations were practically unchanged, standing at $1.08 for up-river fine but there was an easier tone in all grades. Trade was equally balanced but some of the market sharps believe that the volume of inquiry is somewhat larger. Shipments of plantations from the East are growing steadily larger and consumers apparently are waiting for lower offerings before accepting commitments on a large scale.

Ohio Receiver to Petition Sale

CINCINNATI, O., Oct. 21—Edward G. Schultz, receiver of the Ohio Motor Car Company, having decided that it will be to the best interest of creditors and all parties in interest to sell the entire plant of the company, including the real estate, machinery, supplies, etc., at as early a date as is practicable, has made application to the court for an order to sell the property at such time, in such manner and upon such terms as the court may deem proper.

The application will be considered in open court by Wade Cushing, Judge of the Court of Common Pleas of Hamilton County, on Tuesday, October 22, at which time all creditors and others interested may appear and express their opinion with reference to said sale.

The appraisers appointed by the Court have filed their report, showing that, in their judgment, the plant as an entirety and going concern is worth $239,000 and if sold piecemeal and in separate lots, is worth $211,000. The liabilities are approximately $180,000, less the value of certain cars held by the banks.

The appraisers were A. A. Geis, connected with The Anchor Buggy Company, Wm. J. Peck, connected with The Hess Spring & Axle Company, and Cecil Evans, formerly superintendent of The Ohio Motor Car Company.

Old Knox Notes Cause Assignments

SPRINGFIELD, MASS., Oct. 21—Another result indirectly due to the recent assignment of the Knox Automobile Company and more directly due to the former difficulties of the company is that of the assignments made by William E. Wright, Albert E. Smith and Elihu H. Cutler of their real and personal property to Walter S. Robinson as trustee. The assignment was brought about because of notes held by several banks which were given by these men at the time the Knox company was reorganized in 1908. The demands of the commercial creditors of the company were satisfied at that time by giving them preferred stock in the reorganized company, but the banks holding notes of the old company endorsed by Messrs. Wright, Smith and Cutler refused to accept this stock as a settlement of their claims.

To make an arrangement satisfactory to the banks the three

Automobile Securities Quotations

The past week saw a continuation of the irregular market for automobile stocks. Goodyear gained 7 points, Goodrich 3, Firestone 3, General Motors 2 1-2, and Studebaker 2. On the weaker side were International, Lozier, Pope, which was down 3 points, and several of the other issues. The table:

	1911		1912	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co.	..	..	150	165
Ajax-Grieb Rubber Co.	..	..	94	98
Aluminum Castings, pfd.	..	..	100	102
American Locomotive, com.	34	36	43	44
American Locomotive, pfd.	105	106	107	108
Chalmers Motor Company	..	..	145	155
Consolidated Rubber Tire Co., com.	6	10	10	15
Consolidated Rubber Tire Co., pfd.	10	20	50	60
Firestone Tire & Rubber Co., com.	170	176	273	278
Firestone Tire & Rubber Co., pfd.	106	108	106	107½
Garford Company, preferred	..	..	99	100
General Motors Co., common	37	38¾	36½	37½
General Motors Co., preferred	75	76½	78	80
B. F. Goodrich Co., common	*234	*238	†72½	†73
B. F. Goodrich Co., preferred	*118	*120	†106¾	†107¼
Goodyear Tire & Rubber Co., com.	225	235	382	385
Goodyear Tire & Rubber Co., pfd.	104	106½	104½	105½
Hayes Manufacturing Company	..	..	..	92
International Motor Co., com.	..	..	17	19
International Motor Co., pfd.	..	..	76	78
Lozier Motor Company	..	..	40	45
Miller Rubber Company	..	..	130	140
Packard Motor Car Co., pfd.	104	106	105½	107
Peerless Motor Company	..	..	115	120
Pope Manufacturing Co., com.	40	50	30	34
Pope Manufacturing Co., pfd.	65	70	70	74
Reo Motor Truck Company	8	10	..	10
Reo Motor Car Company	23	25	..	22½
Studebaker Company, common	..	..	43¼	44
Studebaker Company, preferred	..	..	94	97
Swinehart Tire Company	..	..	100	101
Rubber Goods Mfg. Co., com.	85	95	100	..
Rubber Goods Mfg. Co., pfd.	100	105	105	110
U. S. Motor Company, com.	23	25	1½	2
U. S. Motor Company, pfd.	67½	68½	3¾	4¼
White Company, pfd.	..	..	105	108

*Old. †New.

men took the preferred stock and divided it among themselves and exchanged their personal notes for the notes of the company which they had endorsed. All three men held executive offices in the company, Mr. Cutler at one time being president back in 1907 before its first failure, Mr. Wright, vice-president and Mr. Smith assistant vice-president and secretary, of the reorganized company. The amount of the notes cannot be learned but it is believed to be somewhere between $80,000 and $100,000. One Springfield bank has some, the others being held by banks elsewhere.

The following officers have been chosen by the corporation: W. E. Wright, president; H. G. Fisk, vice-president; A. E. Smith, treasurer; Charles H. Beckwith, clerk. A committee has been named to investigate conditions.

Dean to Make Otho System

ELYRIA, O., Oct. 21—The Dean Electric Company, of this city, has secured the exclusive manufacturing rights for the Otho electric system for lighting and starting automobiles. The device is a single motor-generator, which serves to furnish current for both lighting and starting. When the motor is in motion the system acts as a generator and when it is necessary to start the engine the functions are reversed and the system bcomes a motor. The power unit takes the place of the flywheel, thus eliminating gearing. It has no brushes or wires in the rotary part of the wheel, the winding and brushes being stationary.

Wishart-Dayton Owes $33,899

Schedules in bankruptcy filed in the United States District Court by the Wishart Dayton Auto Truck Company show liabilities of $33,899 and nominal assets of $13,569. The latter consist of one truck, a few accounts and a claim of $10,000 for damages against the Dayton Auto Truck Company. The creditors are mostly banks.

Market Changes of the Week

Lead, rubber, and tin experienced small changes in the market during the past week. Lead closed at $5.07 1-2, a loss of $.02 1-2. Rubber's decline of $.03 was due to small sales, while tin, which had a gain of $.03, fluctuating throughout the week, closed at $5.02, due to lack of speculative interests. Linseed oil, which has been constant in the market, suddenly dropped $.04, closing at $.60. This is due to the decline in seed prices at Duluth.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, per lb.	.08¾	.08¾	.08¾	.08¾	.08¾	.09¼	+.00½
Beams & Channels, 100 lbs..	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, Pittsburgh, ton	27.50	27.50	27.50	27.50	27.50	27.50	.....
Copper, Elect., lb.	.17⅜	.17½	.17½	.17½	.17⅜	.17⅜	.00 1/40
Copper, Lake, lb.	.17½	.17½	.17½	.17½	.17½	.17½	.....
Cottonseed Oil, Oct., bbl.....	6.26	6.25	6.27	6.19	6.04	6.04	—.22
Cyanide Potash, lb.....	.19	.19	.19	.19	.19	.19	.....
Fish Oil, (Menhaden) ..	.33	.33	.33	.33	.33	.33	.....
Gasoline, Auto, 200 gals. @..	.21	.21	.21	.21	.21	.21	.....
Lard Oil, prime.	.85	.85	.85	.85	.88	.88	+.03
Lead, 100 lbs...	5.10	5.15	5.13	5.13	5.13	5.07½	—.02½
Linsed Oil.....	.64	.64	.64	.64	.61	.60	—.04
Open-Hearth Steel, ton....	28.00	28.00	28.00	28.00	28.00	28.00	.....
Petroleum, bbl., Kan., crude...	.70	.70	.70	.70	.70	.70	.....
Petroleum, bbl., Pa., crude....	1.60	1.60	1.60	1.60	1.60	1.60	.....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	.....
Rubber, Fine Up-river Para.	1.09	1.09	1.07	1.07	1.07	1.06	—.03
Silk, raw Ital..	....	4.40	....	....	4.40	....	.....
Silk, raw Japan..	....	4.10	....	....	4.02½	....	—.07½
Sulphuric Acid, 60 Beaumé...	.99	.99	.99	.99	.99	.99	.....
Tin, 100 lbs....	4.99	4.98	5.02	5.01	5.04	5.02	+.03
Tire, scrap.....	.09⅛	.09⅛	.09⅛	.09⅛	.09⅛	.09⅛	.....

Briscoe Resigns His Post

Organizer of U. S. Motors Makes Room for New Man Unhampered by Influences of the Past

Will Go Abroad—New Stock of $35,091,393 Company Introduced in New York Curb Market

BENJAMIN BRISCOE, president of the United States Motor Company, has announced his retirement from the leadership of the corporation to take effect about November 15. The resignation was presented to the directors 3 weeks ago, or as soon as it was apparent that the reorganization plan would go through substantially on the basis agreed to by the creditors.

Mr. Briscoe has been a prominent figure in the automobile world for many years, but has been a leader since 1910. He was one of the founders of the Maxwell-Briscoe Motor Company, Briscoe Manufacturing Company and other large and profitable concerns. He was instrumental in the formation of the United States Motor Company. He was organizer and president of the A. M. C. M. A., and at present holds the post of vice-president N. A. A. M. He is secretary and director of the Automobile Board of Trade.

Mr. Briscoe has announced that he contemplates a trip to Europe with his family, during which he will arrange several matters of importance to the extension of the export business of the company.

The new stock issues of the reorganized company have been introduced into the curb market and have been traded in conditionally since last week. All the transactions are made with the proviso that the deliveries shall be made when the stocks are issued. The new common sold as high as 11 1-2; first preferred up to 80 and second preferred at 40.

Under the proposed plan of reorganization the stock will remain in a voting trust for not to exceed 5 years, except such shares as are required for the qualification of directors. The capitalization will be:

First preferred, 7 per cent cumulative.....	$11,000,000
Second preferred, 6 per cent. non-comulative.....	9,000,000
Common	11,000,000
Existing Real Estate mortgages.....	164,540
Total	$31,164,540
The total authorized capitalization will be.....	$35,091,393

In a tabulation of estimated earnings for the first full fiscal year under the reorganization, the net is placed at $1,500,000. This sum would be sufficient to pay dividends on both preferred issues and leave $190,000 for the common.

Charles H. Sabin, Henry Bronner and James C. Brady have been named as the voting trustees in whom the active rights of the shares shall be vested for a term of years.

The underwriting syndicate by which it is proposed to finance the new company has agreed to purchase for $5,720,996 all the voting trust certificates representing the stock allotted to assenting stockholders.

The Central Trust Company, of New York, has been designated as depositary for securities and claims.

The return day for the court action commenced by the Brown & Sharpe Manufacturing Company is October 28, when it is expected that the official status of the proposed reorganization will be determined.

Benjamin Briscoe, in referring to his forthcoming departure from the company, said: "I am going away for a rest and one of the main objects will be to regain the correct perspective of things. I believe that some other man, unhampered by any of the old influences and traditions of the company, can carry it through successfully. I have been asked to remain, but I feel that it would be better for me to go."

Willys Adds $10,000,000 Capital Stock

Willys-Overland Capital $25,000,000—Banker Buys $7,900,000—Willys Retains 75 Per Cent. of Stock

Conservative Expansion To Follow—No Changes in Management—Willys Retains the Presidency

John North Willys, president of the Willys-Overland Company, Toledo, O., has increased the capital stock of this company from $15,000,000 to $25,000,000 and in doing so has sold outright $7,900,000 common and preferred stock to Wm. Salomon & Co., bankers, 25 Broad street, New York City, and retains 75 per cent of the company stock himself. Under the new capitalization the division of common and preferred stock is as follows:

Total capitalization	$25,000,000
Common stock	20,000,000
Preferred stock	5,000,000

The ownership of this stock is divided between Mr. Willys and the Salomon company as follows:

J. N. Willys common stock	$15,000,000
J. N. Willys preferred stock	2,100,000
W. Salomon & Co. common stock	5,000,000
W. Salomon & Co. preferred stock	2,900,000

The purchase of $7,900,000 by Salomon & Co., in common and preferred, means that this will be for general sale and application will be made to have this stock listed on the New York Stock Exchange.

Up to the present time Mr. Willys has been sole owner of Willys-Overland stock, both common and preferred, and this issue of additional capital and its sale means that Mrs. Willys will practically take this amount of money in cash to himself.

No changes will be made in the direction or control of the Willys-Overland Company because of this expansion. Mr. Willys, who is now president, will continue in this capacity and direct the affairs of the organization as he has done in the past, and his able corps of lieutenants will be continued. There will be a gradual and conservative expansion of the company as well as of the five subsidiary companies, namely:

Kinsey Mfg. Company	Toledo, O.
Federal Motor Works	Indianapolis, Ind.
Garford Mfg. Company	Elyria, O.
Morrow Mfg. Company	Elmira, N. Y.
Gramm Motor Truck Company	Lima, O.

No changes will be made in the management of these organizations, of which the Willys-Overland Company is a holding organization, the $25,000,000 stock of the Willys-Overland Company representing the stock of these companies, which are as follows:

Kinsey Mfg. Co., capital	$3,000,000
Morrow Mfg. Co., capital	1,000,000
Federal Motor Works, capital	300,000
Gramm Motor Truck Co., capital	1,500,000
Garford Mfg. Co., capital	2,000,000

While purchasing practically 25 per cent. of the Willys-Overland stock Wm. Salomon & Co. will not be represented on the executive committee, but it is understood that the board of directors will be increased from five to seven and that the two added members will represent the Salomon capital, giving Willys a representation of five.

With the ending of the Willys-Overland fiscal year on June 30, 1912, the statement showed a profit of $3,300,000 for the previous 11 months. Prospects are that for the coming year this will be greatly increased. The company is at present shipping 150 cars per day. The output for 1913 is 40,000 cars, and for the year following 60,000 is the mark. The company will ship 15,000 cars from July 1 to December 31 of this year.

All of Mr. Willys' capital is not tied up in the Willys-Overland and subsidiary companies, but he has additional investments of $3,000,000 in other companies in the automobile business, so that his present holdings in the industry total $20,100,000.

At present the working force in the various Willys interests are as follows:

Willys-Overland, 5300; Kinsey, 1200; Morrow, 1000; Garford, 900; Gramm, 400, and Federal, 300. Total, 9,100.

These companies are engaged in the following manufacture: Kinsey makes frames and radiators for the Overland and the trade in general; the Morrow company manufactures gearset, universal joints and screw machine parts for Overland and the trade; the Federal manufactures motor and repair parts for the trade; the Garford company builds pleasure cars and trucks, and the Gramm company builds trucks.

Mr. Willys has announced some future plans for the Gramm and Garford concerns. Attention will be focused in the Gramm on bringing out a new 150-pound delivery truck, and at the Garford a new six-cylinder car to list around $2,500 will be brought out soon.

During the last 10 days rumors have been frequent to the effect that a merger of the Willys and other factories were on foot, but Mr. Willys positively denies such and officially states that the increased capitalization and sale of stock to Salomon are the only negotiations that have been on foot.

Bayerline in Charge of King Plant

DETROIT, MICH., Oct. 21—The King Motor Car Company, the entire assets of which were purchased outright by Artemus Ward, of the firm of Ward & Gow, of New York City, has been placed on a sound financial basis by its new owner. Already operations have been commenced in the plant for the turning out of the new models for the 1913 season, which consist of a roadster, tuoring car and coupé. The personnel of the new company has been changed and it is in the hands of men who have had long experience in the automobile industry. J. G. Bayerline, formerly connected with the Pope-Toledo, Pope-Hartford, Oldsmobile and Hudson companies and up to a short time ago vice-president and general manager of the Warren Motor Car Company, has assumed the management, while T. A. Bollinger has been made factory manager.

It is the intention of the new King company to protect owners and all guarantees issued by the old concern will be assumed. It is also announced that a complete supply of repair parts will be carried in stock, and that deliveries on the new models are now being made. The cars will continue to be sold under the trade name of King.

Tractors Busy in Canadian Fields

WINNIPEG, MAN., Oct. 21—During the past summer 6,500 motor tractors have been breaking new land for crop next year in the Canadian west. Putting their daily average at the extremely low figure of 10 acres a day, and allowing them 60 days' work during the season, this would represent 3,900,000 acres of new land for 1913, and to this must be added the many thousand acres that have been broken by horses and oxen.

Daimler Import in Bankruptcy

Bankruptcy proceedings have been instituted in the United States District Court against the Daimler Import Company, which up to a short time ago represented the importation of Mercedes cars and trucks into the United States. The crisis resulted from alleged non-payment of rent to Harry Content & Company, owners of the premises at 751 Fifth avenue. The claim is for $1,826. The Daimler Import Company was incor-

porated under the laws of New York in June, 1910, and the capitalization was placed at $300,000. The recent agreement or compact with the Paul La Croix Automobile Company to handle the pleasure cars of the line and the achievement of the rights to import and manufacture the truck line by the General Vehicle Company foreshadowed some developments with regard to the importing company.

Judgments in favor of banking creditors have been rendered against the company within the past week amounting to $23,278. Nobody with any substantial interest in the company would predict its future course and Paul La Croix stated that he understood that the concern had been practically abandoned.

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La Croix Threatens Mercedes Infringers

Aggressive action on the part of the American representatives of the Mercedes pleasure cars has been indicated by the announcement made by Paul La Croix, of New York, licensee of the Daimler Manufacturing Company, that infringement of the Mercedes patents and the license rights of the La Croix company will result in prosecution.

The chief element of the difficulty is that a number of Americans have purchased Mercedes cars abroad and imported them without paying license to La Croix. The broader question of patent infringement is included in the problem but is not foremost as a factor in immediate action.

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Solid Tire Company for Cincinnati

CINCINNATI, O., Oct. 21—The Ideal Steel Wheel Company, a new Cincinnati corporation, has bought the former plant of the Seufferle Cooperage Company. The transaction is said to have involved $41,000. The new corporation, formed under the direction of the Kirgen-Parker Company, expects to produce a solid tire. The general dimensions of the building just acquired are 200 by 226 feet, together with several minor structures. According to the president of the company, this will be greatly enlarged. J. B. Fitch is president; J. E. Strielmeiler, the inventor of the tire, vice-president; E. H. Massey, treasurer, and Harrie Walker, secretary and manager.

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Mexican Row Cuts Rubber Profits

Owing to the Mexican revolution the profits of the Intercontinental Rubber Company for the fiscal year ending July 31 showed a large decrease as compared with the previous year. The net profits from operation, available for dividends and surplus were $1,108,959, a loss on that item of $1,531,559, in comparison with the showing of 1911. Regular dividens were paid on the preferred stock, amounting to $87,500, but the distribution on the common was passed. The company earned an amount equal to 3.52 per cent. on its common capitalization of over $29,000,000. The insurrection caused a halt in commercial shipments as well as cultivation of guayule. The situation is rapidly improving in the vicinity of the company's properties and a resumption of business on a broad scale is probable in the near future.

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Souther to Study Wire Wheel Rims

Henry Souther, metallurgical expert and former president of the Society of Automobile Engineers, has sailed for Europe in company with two representatives of the Standard Roller Bearing Company to inspect the plant of the Rudge-Whitworth Company in England and to visit other manufacturing plants on the continent.

It has been announced that Mr. Souther and his party will make a special study of the combination of the Sangster-Houk demountable rim with wire wheels of the type made by the Rudge-Whitworth company.

British Gale Is Thin Air

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English Expert Says That There Is No Foundation for Report of Giant Company to Fight America

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Government Asks Bids for Automobiles to Be Used in the Service of Various Departments

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COVENTRY, England, Oct. 14—I do not know where your New York correspondent gets his information from, but he is considerably at sea when, in your issue of September 25, he writes and talks of the formation of a $25,000,000 capitalization here to compete with the American cheap cars which are coming over here in quantities. You can take it from me that there is not $25,000,000 in this country available for any sort of wildcat scheme which financiers choose to put forward, but the real trouble with the British industry is that adequate capital is lacking for dealing with it as it should be dealt with and the failure of your big combination to make good does not help things any..

The truth about this story of the $25,000,000 company to meet American competition is that one of our halfpenny papers—what you would term the yellow press—got its hair off over the success of the Ford and beat the big drum on the decline of British industry and the Americans sweeping the board. One or two of our impressionables here in trade, who were out for a bit of self-advertisement as much as anything else, played up to them, with the result that the paper gave a swagger invitation dinner to the trade to discuss things. None of the representative British houses took the trouble to go, but a few others attended at the dinner and talked, and the talk was around a wholly impracticable proposal—of Mr. William Letts—for a combination of British firms to make a cheap car and another suggestion was that a $2,500,000—not $25,000,000—independent company might be formed for the purpose. The general result of the discussion was a beating of thin air. Both suggestions were turned down as unworkable and, having digested the newspaper's good dinner, the crowd went home. And I think you can leave it at that. Our manufacturers of class cars are not tumbling over themselves to get into the cheap trade any more than are the Peerless, Packard, Pierce-Arrow and other makers on your side who are making similar class machines.—HENRY STURMEY.

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Government Seeks Bid on Automobiles

WASHINGTON, D. C., Oct. 21—More than ordinary interest attaches to a call for bids issued by the general supply committee of the government departments for furnishing various branches of the government service with both gasoline and electric vehicles. The bids will be opened in this city October 29. Complete specifications are given in the blanks to be furnished manufacturers who have been asked to submit proposals. The specifications have been standardized by the Bureau of Standards, the purpose being to have trucks of a distinct type in the government service in the future. The specifications call for bids on trucks ranging from 1,000 pounds to 3,000 pounds capacity. The small trucks are intended for mail wagons, but the government does not yet know whether it will buy small or large machines or how many of each type after the sizes have been determined by actual test.

The object of asking for bids on different types of cars, both electric and gasoline, is to obtain comparative information as to prices, etc. Manufacturers are told that for the present probably not over six machines will be bought, but that this number will be increased in the future.

G. M. Profits $4,746,756

Company's Net Earnings for Fiscal Year Come to That Amount—Surplus of $2,856,082

Gross Business Totaled $64,744,496—A Gain of 50 Per Cent. Over 1911

DETROIT, Oct. 21—The annual report of the General Motors Company for the fiscal year ending July 31, 1912, has been issued. The gross business done during the year reached the enormous figures of $64,744,496, as against $42,733,303 in 1911, or slightly over 50 per cent. increase. The net profits of the year were $4,746,756. Fixed charges of $850,463 for interest on the 6 per cent. loan and dividends on the preferred stock of the company of $1,040,210 are deducted from the net manufacturing profits, leaving a surplus of $2,856,082.

At the end of the 1911 season there was a surplus in the treasury of $1,240,175 and by adding the surplus for the year ending last July the total surplus was brought up to $4,096,258.

Prior to October 1, 1910, certain inventories were made covering material and assets that are now considered obsolete. Last year a part of this obsolete material was written off and this year, following the usual rule, the directors have wiped out $2,833,594, which is practically the amount of additional surplus accumulated during the past year. After making this deduction the surplus account stands at $1,262,663.

The subsidiary companies operated at a profit of $5,770,177, but from that sum losses of $1,023,421 are deducted, covering the operations of unsuccessful concerns affiliated with the big company. The report states that all the subsidiaries completed their manufacturing schedules on time and disposed of all their product before the close of the fiscal year.

The inventories have been given a rigid examination with the result referred to above, and President Neal states that the action of the directors in writing off and abandoning the eliminated items will afford material relief to the manufacturing and sales organizations and make for further efficiency as the organizations will not have to try to salvage obsolete and undesirable models, materials and products.

With regard to the distinct plan of centralization that has been introduced since the new management took control of General Motors, President Neal says:

"Accordingly, your directors have been gradually concentrating the operations of the smaller companies with the larger and more profitable companies, or else, in some cases, eliminating the greater part of their machinery operations and so turning the operations of the smaller companies into plants merely for the assembly and distribution of automobiles. This policy was inaugurated cautiously, and necessarily has proceeded slowly. The transfer of the manufacturing operations has in most cases involved the completion of the entire operations in hand at the smaller factories and also generally the design of new models for the necessarily standardized output of the larger factories could be utilized. This process has gathered momentum during the year just closed, and will be continued in the case of several of the companies during the coming year, the machinery of the smaller plants being gradually concentrated at the larger manufacturing plants."

This explains the course of the company with regard to the Marquette and Elmore factories.

Motors for the automobiles of some of the smaller companies are made by the Northway Motor & Manufacturing Company, which produced 10,430 last year and is scheduled to make 20,000 during the current fiscal season. All the product of the motor company is not used by the General Motors subsidiaries and the surplus is sold to outside manufacturers of automobiles. According to the report, the advantage of centering engine manufacture in a special plant lies in the fact that the smaller users get a better motor for less expenditure of money, time and trouble.

The foreign business of the company, exclusive of Canada, has about doubled and was approximately $1,700,000 during the past year.

The Weston-Mott Company, which makes axles for several of the subsidiaries and the stock of which was about half owned by General Motors, has been fully purchased. The outstanding capital stock, amounting to 50.2 per cent., was purchased by exchange of securities, of which $520,000 of common and the same amount of preferred was a part.

The number of employees at the time the report was made, which was some time after the close of the fiscal year, was 17,173. This compares with the high number in 1911 of 11,474 and 1912 of 16,584. President Neal in conclusion states that during the first 2 months of the present fiscal year the receipts of the company have been over $1,000,000 more than they were in the corresponding period covered by the tabular report.

The capitalization of the company outstanding is as follows:

Preferred cumulative 7 per cent	$14,936,800
Common	16,371,183
Total	$31,307,983

This represents an increase of $543,300 preferred and $548,853 common during the year.

The funded debt of the company October 1, 1910, consisted of $15,000,000 of 6 per cent. gold notes. Since that date the amount has been reduced by sinking fund operations to $11,922,000, the proportion taken care of and retired this year being $1,530,000. The total amount of the reduction to date is $3,078,0000, which represents a reduction of the item in the fixed charges of $184,680 per annum. The notes are due October 1, 1915, and under the original schedule the outstanding indebtedness will be reduced at least $5,500,000 by that date.

This would leave the bonded debt at $6,422,000, even if a larger proportion of the notes is not retired in the meantime.

In acquiring the Weston-Mott Company General Motors assumed $600,000 of notes issued by the company. Half of this issue has been retired and the other half is due next September.

The condensed balance sheet for the year is as follows:

ASSETS

Fixed assets: real estate, plants and equipment	$19,280,888
Patents, agreements	1,871,436
Investments	560,499
Cash	3,080,920
Notes and accounts receivable	4,229,112
Inventories	17,578,366
Prepaid expenses	422,736
Total	$54,958,158

LIABILITIES

Capital stock	$31,307,983
Bonds, as of July 31, 1912	12,452,000
Stocks of subsidiaries not owned by General Motors	991,838
Current liabilities	4,382,876
Reserves for dividend	261,394
Reserves for special purposes	4,299,471
Surplus	1,262,594
Total	$54,958,158

The constituent companies of General Motors are as follows: Buick, Cadillac, Oldsmobile, Oakland, Elmore, Cartercar, Northway Motor, Peninsular (formerly Marquette), Randolph, Rapid, Reliance, Welch-Detroit, Welch, Champion Ignition, Jackson-Church-Wilcox, Michigan Auto Parts, Michigan Motor Castings, Oak Park Power, McLaughlin, Weston-Mott, General Motors Export, General Motors Truck, General Motors, Ltd., General Motors Company of Michigan.

The official roster of the company is as follows: Thomas Neal, president; W. C. Durant, C. W. Nash, Emory W. Clark, vice-presidents; Standish Backus, secretary; James T. Shaw, treasurer, and W. H. Alford, comptroller.

Applying Chassis Finish

Running Gear Should Be Thoroughly Painted and Surfaced Before the Car Is Taken from the Shop

Car Owner Should Study Qualities of Various Varnishes and Should Aim at Uniformity of Color

IT is not an easy matter to obtain a varnish that will stand up and shine with a strong luster through the hard and varied service to which the average car is exposed. Such a varnish, for one thing, must have great elasticity and at the same time it must dry hard as nails. No vehicle has so much harsh cleaning and such varied methods of cleaning applied to it as the automobile. Road conditions are often bad beyond description. Some one lately returned from a tour of the West in an automobile has said that **"the highways of the United States furnish a greater variety of mud and dust, a large part of it being of the worst imaginable sort, than any country under the sun."** This explains in part, at least, why it is so difficult to keep the car in proper condition even though frequent varnishing be resorted to.

Usually the chassis presents the most neglected and unkempt appearance. It has been customary heretofore, we believe, to apply an ordinary finish to the chassis and let it go at that, which practice, it goes without saying, is entirely at odds with the actual needs of the situation.

The chassis should have thorough-going methods of painting and surfacing applied to it, and no car owner should take the car from the shop unless the evidence is unmistakable that such methods of work have been applied to the running parts. Over these parts a couple of good varnish color coats should be applied, both to be rubbed lightly with pulverized pumice stone and water. Then have the striping applied, after which arrange for a coat of clear rubbing varnish, this to be in due season topped off with a stout coat of a quick-drying elastic varnish.

Especially should the chassis varnish be capable of resisting the action of soap, much of which is used in cleaning these parts of the car. The more nearly the varnish will resist and prove immune to the action of soap and water the more valuable it becomes to both the painter and to the car owner. In trying out a varnish for its capacity to do the things here referred to **the car owner should go into something like definite details so that eventually he can choose for himself, if he so wills, the varnish best adapted for his particular needs.**

Logically the finish on the automobile hood should be baked on and it should consist of as few coats as possible consistent with a finish to correspond with other parts of the car. For a new hood, clean off dirt and grease and apply a metal primer and bake in an oven for three hours at a temperature of 175 degrees. Over this put on a knifing surface, working it down smooth and fine, and bake at 200 degrees for three hours. Then sandpaper this coat thoroughly, after which apply two coats of some reliable baking enamel. If this enamel is black bake for five hours at 200 degrees. Then two coats of a hard-drying but elastic finishing varnish, each coat baked for five hours at 125 degrees, should be put on. **Generally speaking the fewer coats comprising the finish for the hoods the more likely is it to escape cracking and fracturing from the heat of the motor.** Engine oil, dirt, rain, etc., on the heated surface of the hood is particularly destructive to any but a finish each coat of which is baked to a nicety.

The fenders of the car are parts upon which an exceptionally good finish is needed; a finish that will stand extraordinary vibration, harsh and constant exposure and severe usage. In washing the chassis with soapy water a process that has reached widespread practice, the fenders apparently come in for a full measure of this treatment, and a finish, therefore, anything short of first class is practically certain to suffer an early decline. **Such a finish should be built up over a foundation consisting of primary coats sufficiently elastic to stand the strain of the rigorous vibration.** This elasticity can be provided by the use of raw linseed oil gradually lessening the quantity in one, two, three order as the coats go on until the color is reached. In the use of japan ground color coats thin down with pure turpentine, adding one part oil to every eight or nine parts turpentine. This will furnish a graduated elasticity over which a couple of coats of varnish-color may be applied, these to be followed by a coat or two, according to the quality of finish desired, of a hard drying finishing varnish which possesses the property of being elastic. The varnish color to be used upon the fenders should be made of finishing varnish, rubbing varnish being too brittle to stand the vibration strain. **No rubbing varnish should be used upon the fender for this reason and for the additional one that it will not properly respond to the contraction and expansion under the variations of temperature to which these parts are exposed.**

Another point which the car owner seeking to develop and maintain the best possible appearance of his car should insist upon is in the treatment of the color coats. In the hurry to get the color under varnish, it is often the case that the color is not adequately dry when the varnish is put on, the result being that the color shows a shade which under normal conditions of treatment it does not possess and which, in fact, it should not possess. The color on the car, when it is given time to dry properly before varnishing, will look, and should look, precisely as the same color looks in liquid form in the mixing cup. Then you have color purity in its original and perfect shade. There are, for example, some of the greens, very beautiful when properly placed on the surface and permitted to dry solid and firm, which if smothered under a coat of varnish before being thoroughly dry will show not only two or three different shades of color, but all of these shades will vary from the true shade.

Another matter of color for the car owner to recognize as important is that of having the same shade of color, when but one color for the body is desired, established over all the surface. In a New York showroom recently the writer inspected a car painted a dark blue, closely approaching Royal blue, which ran through two or three shades. This was due, apparently, to the neglect of the painter to mix up enough color at one time to coat the entire surface. In mixing up a second batch of the color he failed to perfectly match it to the first lot and the subsequent coats of varnish had served to exaggerate the varying color shades.

The prospective car buyer may very properly subject the color on the car to close inspection for uniformity of color. A lack of this quality does much to put the appearance and finish into disrepute.

The car owner should understand and familiarize himself with the fact that virtually all colors used in automobile painting to-day are delicate and sensitive colors in that they require thorough varnish protection. Because of this need the car requires to be varnished at least a couple of times a year—say in spring and autumn. In this manner the colors are made to wear longer and appear to better advantage, while they are wearing, than would be the case in the event of deferring the revarnishing until the old varnish has quite lost its protective capacity.

Especially is the varnish protection here advised of value in getting permanent or durable wear out of the rare and lovely lake pigments now so largely used upon automobile work.

Compact Dynamometer Adaptable to Outdoor Efficiency Testing—Sprags Denounced in Germany as Antiquated—New Removable Rim—The "Bumpograph" to Save Lives and Money for Railways—World Trust in Aluminum—Sundry Topics

TRANSMISSION Dynamometer—A device has been developed by A. Wallon by means of which it should be practicable to determine the amount of power utilized for propelling an automobile at any given speed and for any actual condition of the road, by applying it to the clutch shaft, and either simultaneously or subsequently to decide the power absorbed in the gearbox and the front universal joint of the driving shaft, by applying it to the latter. Perhaps it could also be used to decide the frictions in the bevel gear and the differential when applied to the wheel-driving shafts. It is a dynamometer which, when equipped with a registering dial or roll, may be used to measure and record, in the form of diagrams, torque and torque reactions under practical working conditions. By using it first under one road condition and then under another with the same vehicle it should lend itself to determinations of the properties of various road surfaces, and similarly it might be used for establishing reliable data with regard to the traction resistance encountered with different tire treads and tire constructions. Its range of utility seems comparable with that of the Wymperic accelerometer, mentioned at length in THE AUTOMOBILE of October 10. A special field for the Wallon device lies in its suitability for measuring at the same time the power applied to a propeller shaft and the thrust of the propeller, whether in the case of boats or aeroplanes. In this application the device promises to remove many doubts with regard to the varying efficiency of propellers throughout the ranges of motor and vehicle speed, while at the same time throwing new light on the different values of different shapes for penetrating water or air.

Unfortunately the exact mechanical construction of the Wallon device is not disclosed, but the principle upon which it operates may be understood in the main features by the following description and the accompanying drawings, Figs. 1 to 6.

The leading principle is that the torque is made to cause a hydraulic pressure, and this pressure is measured. To this end the motor shaft is coupled to the driven shaft by means of a sleeve secured to the latter. In the sleeve is secured a jaw clutch to which corresponds a clutch member on the shaft. Both are cut helically with a pitch exceeding 45 degrees, so that the turning of either the shaft or the sleeve will tend to force the two clutch members apart. To minimize and regulate friction between them, ball-bearings in a suitable casing are interposed between the helicoid working surfaces. Figs. 1 and 2 show the shaft and the sleeve separately but not the ball bearings. The sleeve is closed and packed around the entering shaft so as to form a sort of dashpot in which, however, the relative movement of the parts is exceedingly small, as the space is completely filled with fluid, preventing displacement of the clutch surfaces. The only movement possible is that necessary for transmitting pressure through the inclosed fluid to the attached manometer. The movement required of the ball-bearing is therefore also very strictly limited, as it must be to make the construction practicable. The manometer may be of ordinary construction, registering or merely indicating, and is connected with the interior of the sleeve by means of such a swiveled valve as shown in Fig. 4 inserted in that end of the sleeve in which the piston and clutch formation of the motor shaft is located. [This arrangement apparently makes it necessary to connect the sleeve with the driven shaft by means of two semi-circular arms or other equivalent elements allowing space for the manometer and the registering apparatus. At this point the fragmentary description suggests that the device may still be in its experimental stage with regard to its mechanical execution for use in automobiles.—ED.]

In order that this device may be used for measuring with accuracy the force applied to establish a certain pressure in the fluid, it is evidently necessary that the reaction between the helicoid surfaces of the clutch, with the intermediation of the ball-bearings, shall be proportionate to the forces by which they are produced. This reaction is represented in the diagram Fig. 3, being the resultant R of the tangential force due to the torque C and of the force P_s which the fluid pressure P exerts upon the cross-sectional area s of the shaft. The tangential force takes the form $C \div r$ if r is the radius of the shaft, and as r, s and a, the latter being the pitch angle of the clutch surfaces, are constants in any one apparatus, the resultant R is bound to be proportional to the torque and capable of furnishing a measure for it. The factor of proportionality may be calculated more simply by applying the theorem of virtual displacements, so-called. If it is assumed that the torque C causes a rotation w of the shaft with relation to the sleeve, then the work of the torque is Cw. The stroke of the piston—the longitudinal movement of the shaft—corresponding to w is $hw \div 2\pi$, in which h is the pitch of the helical surfaces. The work of the pressure is then equal to $Ps \times hw \div 2\pi$. When there is equilibrium between the work done by the torque in displacing the clutch and the work done by the clutch in effecting a pressure upon the fluid—or, in other words, when the power is transmitted integrally from the driving to the driven shaft—the two values become equal, or

$$Cw = Ps \times hw \div 2\pi$$

from which

$$C = P \times sh \div 2\pi = PK$$

if K is the constant factor corresponding to $sh \div 2\pi$ in any given apparatus.

Applying the usual formula for converting the force into horsepower [under the French notation in which 60×75 kilogram-meters corresponds to 33,000 foot-pounds in the English notation], the above value for the torque is equivalent to the following for horsepower:

$$\text{Horsepower} = PK \times 2\pi n \div (60 \times 75)$$

and this takes the simpler form of PnK' by summarizing the constant factors as K'. In order to simplify calculations with any given apparatus its dimensions are so co-ordinated that K' becomes a simple factor, preferably a power of 10.

A dynamometer constructed on this principle is very robust and gives readings whose accuracy depends upon the sensitive-

ness of the manometer used with it. As the quantity of liquid moved in it is very small, the variations in torque are not masked by any effect arising from the inertia of parts, even if the variations are rapid, and the diagrams taken from it should be reliable. It is also not affected by centrifugality owing to its great compactness, and it may be operated at a speed up to 1,500 revolutions per minute or more.

[On the other hand, since PnK' means that the manometer pressure should be multiplied by the number of revolutions and the product by a certain constant factor, a revolution-counter with registering device must be synchronized with the manometer register if it shall be possible to compare two or more performances which are not conducted with exactly the same motor speed, and this a constant one pending the duration of the test. It also seems that the friction of the piston-shaped end of the driving shaft would influence pressure-readings relating to rapid variations of power, though not those relating to a constant power development, since this friction must be considerable in order to make the piston so tight that no leakage can take place. These discrepancies may be only apparent, however. A complete description of the apparatus might show them to be obviated in some manner.—Ed.]

Figs. 5 and 6 indicate how the device is used to measure both the power applied in driving an aeroplane propeller and the thrust against the atmosphere into which this power is transformed. In the position represented in Fig. 5 the thrust is received by the collar A (the thrust being toward the propeller), and the reading of the manometer will then indicate only the torque transmitted to the sleeve. But by releasing the collar A from rigid relations to the frame, as indicated in Fig. 6, and fixing collar B in the frame so as to absorb end-thrust from the sleeve, the manometer will show a pressure smaller than before, as the propeller thrust, now released, works oppositely to the pressure caused by the spreading of the clutch. By determining the factor of loss in transmitting the propeller thrust, or pull, to the clutch elements, the equation by which the propeller efficiency may be determined takes the form

$$P_1 = C \div K = P_2 + (T \div S)$$

in which P_1 is the previous manometer pressure, equaling the torque C divided by a constant K, and P_2 the new manometer pressure, T the propeller thrust and S a constant expressing the loss in the transmission of the thrust.—From *La Technique Moderne*, October 1.

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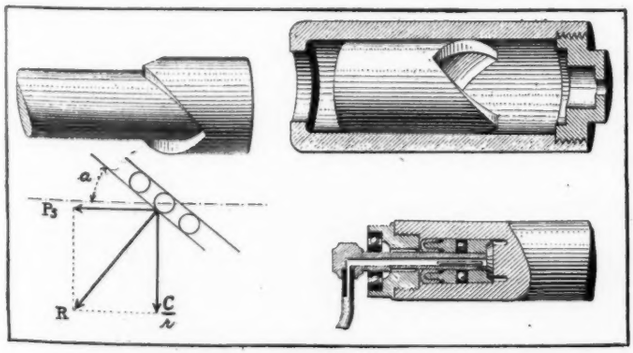
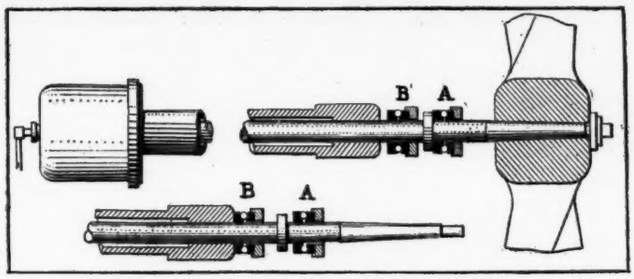
LOCATION of Sprags—An exhaustive analysis of sprags, with special reference to the compulsory equipment of German army motor trucks with these devices, has been prepared by engineer Schwerdtfeger of Frankfurt-am-Main. He is of the opinion that it would be better to rely on good brakes and supports this opinion with a number of diagrams taken from truck and touring car practice and with many accompanying calculations. The most important viewpoints with regard to the reliability of the sprag deal with the uncertainty



Features of the Wallon transmission dynamometer
Fig. 1—End of driving shaft. Fig. 2—Sleeve filled with fluid
Fig. 3—Diagram of reactions. Fig. 4—Valve to manometer



Wallon dynamometer applied to propeller shafts
Fig. 5—Arranged to measure the power. Fig. 6—Arranged to measure thrust

of making the sprag take hold in the ground if the latter is hard and uneven and the sprag is held at a small angle, which otherwise would give the best support once a resting point were found, and with the danger of having the vehicle climb over the sprag if its angle is large. If the last-mentioned trouble is obviated by tying the sprag up to a maximum angle, it may not take hold in soft ground. If a double sprag is used, the likelihood is that only one of the points will take hold at first, and in that case a turning of the vehicle around the point which has become fixed is to be feared. The most important conclusion is that a sprag, if it must be fitted, should be hung from the front portion of the vehicle and not so as to take effect under or behind the rear axle. The argument in this respect is taken from calculations showing to what extent the application of a sprag takes the load off the driving wheels at different angles of the sprag and at different inclinations of the road surface. It is especially accentuated that the greater the gradient of the road the more of the load will be taken off the rear axle, and that consequently, when the vehicle is to be started to go forward again, the difficulty in obtaining traction for the driving wheels will be in direct proportion to the need of it. As another reason for the abolition of sprags in favor of strong brakes, it is mentioned that there may be need of stopping a vehicle when it is going down a steep hill as well as when it is going up and that therefore if one sprag is necessary or desirable, two of them should in reality be fitted, capable of acting in opposite directions. Any other view would seem to stigmatize the sprag as a survival from the time when brakes would hold only in one direction.—From *Der Motorwagen*, September 10 and 20.

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HARMONIC Noises—Most modern automobiles produce a humming noise at certain vehicle speeds while quite silent at other speeds, both higher and lower. The phenomenon is noticed in new cars as well as in old ones but perhaps mostly in those of light construction. As silence in operation is one of the properties most sought by constructors and most remunerative to manufacturers as well as pleasing to users, it is worth the while to seek the cause. It is perhaps to be found in the law of harmonics. It is well known that when a sharp note is sounded in a room its volume is much increased if there are objects in the room capable of emitting the same sound by vibration. One piece of cut-glass responds to one sound, another to a sound of different pitch. A note produced on a violin or by the voice is strengthened by resting one foot on the pedal of a piano, thereby leaving those chords free to vibrate which correspond to the tone produced. Frequently piano keys are seen moving as of their own accord when a person sings or a dog barks sharply. In the electric field similar things take place. Induction coils and transformers have been ruined by the great tension produced when the vibrations of one high tension current got into harmonic relations with those of another.

It seems probable that the different parts of an automobile, being made of steel and all vibrating more or less when the motor is working and the vehicle is shooting over the inequalities of a road surface, may get into similar harmonic relations under cer-

tain combinations of circumstances varying for different vehicles. A certain motor speed and a certain vehicle speed, combined, may set up vibrations in different parts of the chassis which strengthen each other and swell to the volume of a noise, the musical note which is primarily produced being spoiled by the accompanying discordant vibrations of other parts. It is noticed that a vehicle will emit such noises when going at a certain vehicle speed on third gear-speed but not when going at the same gait on the high gear, the inference being that in the latter combination the motor vibrations and those of the frame do not concord. In the American Ford cars which always travel on high gear the sound is produced always at between 40 and 45 kilometers per hour, but it does not come from either the motor alone or the chassis alone; for, when going down hill at the same speed but with the motor out of action the sound is not observed. Also, with any car, when the stage is reached at which the noise is heard and one then advances the spark and thereby interferes with the mathematics of the motor's vibrations, the sound disappears suddenly—only to reappear at another combination of motor and vehicle speed, however.

While probably no mathematical stringency is applicable in the case of automobiles to avoid the noises referred to, the observed facts seem to point a way to their suppression by experimental methods, perhaps especially by tying up those parts which are capable of regular periodic vibrations with others which are not so constituted.—After Antonin Marechal, engineer, in *Pratique Automobile,* August 10.

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REMOVABLE and Demountable Rim—An engineer by name Laisne of Douai, France, has had made for himself a removable rim in which it is the main feature that the pneumatic tire is held by its two beads in a thin and elastic steel ring which at one point is split transversely and that this steel ring is held between the hooked flanges of a much stouter two-piece rim, one side of which is demountable. The other and larger part is, in the case of a wood wheel, secured directly upon the felloe and is recessed circumferentially at the edge which lies upon the felloe to receive an annular flange of the demountable side of the rim. At three or four points of the thinned edge of the permanently fixed rim portion there are shallow recesses formed to accommodate wedge-shaped lugs on the interior side of the overlapping annular flange of the other portion. These lugs are split, the slit going through the overlapping flanges as well, and in line with each of them a lug with a bolt hole is secured to the same rim portion, probably by autogenous welding, and by passing a bolt through this hole from the opposite side of the wheel felloe and under the permanent rim portion and drawing it tight with a nut, the shallow split lugs are drawn into the recesses under considerable tension, and in the same operation the thin elastic steel ring with the inflated tire, having been first placed in its proper position with relation to the permanent portion of the rim, is securely locked. The split lugs and the recesses may be formed by stamping with a die.

As applied to wire wheels the permanent rim portion is formed so as to replace the wheel felloe and the spokes are secured to it in the customary manner.

The valve hole in the elastic steel ring is slightly flanged so as to fit into the valve hole of the permanent rim portion, thereby protecting the valve stem and obviating rotation of the steel rim. To fit the latter to the tire it is only necessary to compress it, making the edges at the transverse split overlap and reducing the ring's diameter, and then to place it inside of the tire and allow it to expand, by which action it engages the retaining beads of the tire, and the latter may then be inflated the split in the steel ring being closed because the circumference of the ring corresponds accurately to the interior circumference of the tire.

The advantage of the construction lies largely in the fact that only the thin steel ring, with the reserve tire mounted on it, is to be carried as a spare part.—From *Omnia,* September 28.

FROM Automobile to Railway—Taking his inspiration from the registering devices which have been used for demonstrating the properties of shock absorbers on automobiles, for example, at the Massachuetts Institute of Technology, Mr. L. Schlüssel, an engineer, proposes in the August number of *Bulletin du Congrès des Chemins de Fer* to use similar devices for the important work of locating weak spots in the rails and roadbeds of railways, thereby obviating accidents. The principle of the mechanism in question is usually that a weight is secured to the free end of a horizontal leaf spring of which the other end is fixed in the floor or other rigid part of a vehicle, and that a registering stylus records on a roll of paper the movements of the weight, which correspond in an exaggerated manner to the jouncings to which the vehicle is subject. Mr. Schlüssel has developed the theory of the movements of such a weight with great detail and many diagrams and maintains that the installations of such suitable recording devices on railway trains, if supplemented by daily inspection of the diagrams taken from them, would not only serve the purpose of locating dangerous spots, but would also save the railway companies much money by locating the stretches where inspection and repairs are unnecessary.—From *Le Génie Civil,* September 28.

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MANGANESE in Castings—At the fall meeting of the Iron and Steel Institute Mr. Coe, of Birmingham, who first called attention to the special behavior of cast iron under the influence of manganese, submitted the results of new investigations of the changes of volumes and temperatures which take place at the moment of freezing in white and gray iron containing this alloy. It appears from this work, which supplements the broader work of Professor Turner on the same subject, that in white iron the manganese causes an expansion at the moment of solidification of the molten mass which is independent of the carbon content and that this expansion reaches maximum at an alloy of 2 per cent. Thereafter the expansion dwindles again, reaching zero at 5 per cent. A new maximum comes at 7 per cent., a new zero at 10. Increasing the alloy still further, a maximum comes at 12 per cent. with a zero following at 15.3 per cent. The expansion remains constant between 21 and 39 per cent. of alloy.

In the case of gray iron there is a minimum expansion at 1.6 per cent. of manganese and thereafter a gradual increase up to 10 per cent. Another maximum was observed at 17.5 per cent.

Hardness is increased up to 2 per cent., then drops between 2 and 2.65 per cent. and thereafter rises steadily, according to Coe's observations.—From *Giesserei Zeitung,* October 1.

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ALUMINUM Makers Combine—The expected coalition of French and American producers of aluminum has come in the form of a new enterprise incorporated with a capital stock of $6,400,000 at Whitney, N. C., under the name of the Southern Aluminum Company. It was founded by the combination of the *Société Aluminium Francaise* and the American Metal Company, the latter previously known as a group in the *Metallgesellschaft* of Frankfurt-am-Main. The combination was presaged through discoveries of new economical processes for extracting aluminum from bauxite and the relations of these processes to the chemical composition of the bauxite beds in France on one side and in America on the other.—From *Giesserei Zeitung,* October 1.

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New Life for Old Rubber—It is claimed that frequent washing with a solution of 1 part of ammonia and 3 parts of water will keep rubber articles from getting hard and brittle with age. Immersion in the same fluid will to some extent restore the softness to old rubber if it is not too thick.—*Exchange.*

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To Remove Rust—It is recommended to rub the rusted part with a woolen rag saturated with a mixture of lactic acid, one part, and oil of lavender, two parts.—*Exchange.*

Diesel Motor Explained

Developed from Experimental Coal Dust Motor—Present Oil Engines Aggregate 1,000,000 Horsepower

THE name oil engines today covers a number of types which utilize fuel oils varying in specific gravity from .68 to 1.0. After the nature of the fuel they use they are sometimes called gasoline, paraffin or kerosene engines, and they may be advantageously divided into two classes, light and heavy oil engines, depending on the density of the fuel used in them. Light oil engines comprise principally gasoline engines of various design, developed after the original Daimler motor, in which fuel averaging .72 in specific gravity is used. The second class includes motors utilizing heavy oils which, unlike the light fuels, cannot be simply carbureted, but must be preheated or prepared for combustion by atomization, as in the Diesel engine.

Priestman and Hornsby-Ackroyd engines comprise the so-called explosion engines. In these engines liquid oil is supplied to a heated bulb or baffle-plate and there vaporized, being then mixed with the carbureting air and ignited.

Diesel engines may be divided into two classes, Diesel type proper and semi-Diesel type. In the former, pure air is compressed to about 500 pounds, when oil is squirted into the cylinder at still higher pressure, causing its spontaneous combustion. In the semi-Diesel type only half the air compression need be used, the ignition temperature being reached by contact with a hot bulb.

Long and expensive research only made possible the Diesel engine of today, which, though now acknowledged as the most important type of oil engine, was not long ago but in its making. In 1892 Dr. Rudolf Diesel applied for his D. P. R. (German patent) and arranged with the Augsburg-Nuernberg Maschinenfabrik and Alfred Krupp of Essen to make all the necessary experiments and tests, a special laboratory being equipped in Augsburg.

It soon developed that Dr. Diesel could not realize his first ideal, the production of maximum temperature just before the combustion which should be isothermic. Water-jacketing proved necessary and a disappointment in view of the original expectations. Nevertheless, Diesel and his backers continued their work and in 1897 produced a 20-horsepower motor surpassing in thermal efficiency all previous internal-combustion types. Licenses were then sold, but until 1903 the Augsburg-Nuernberg stood practically alone as its manufacturer, due to difficulties first met by the licensees. In 1898 the Allgemeine Gesellschaft fuer Dieselmotoren, A. G., Augsburg, was formed, which acquired all rights to the Diesel designs. Vertical single-acting, horizontal single and double-acting and reversing marine types have since been developed and the total horsepower of Diesel engines in use today approximates 1,000,000.

In external and internal-combustion engines where useful work is produced from heat a heat fall is utilized, which may be measured by the number of thermal units made mechanically available by the transformation of the heating fluid which passes through the engine and whose temperature is simultaneously reduced. The fall of temperature, however, is in itself no measure of the heat fall, depending as it does on the manner of introducing and abstracting the heat-carrying fluid from the engine. As only a fraction of the heat introduced may be utilized mechanically there is a ratio between the heat theoretically abstractable from the fluid and between what is actually obtained in the form of power; this ratio which is always a true fraction is called actual thermal efficiency. But as the amount of heat which theoretically may be utilized is also but part of the heat introduced, the ratio between these two values is also a true fraction, the theoretical thermal efficiency. The latter is in turn greater than the actual thermal efficiency, and their ratio is referred to as efficiency ratio. The latter is for condensing steam engines using saturated steam, 60 to 80 per cent.; for condensing steam engines using super-heated steam, 50 to 70 per cent.; gas engines, 80 to 88 per cent., and oil, including Diesel engines, about 75 per cent.

Dr. Diesel first attempted to obtain maximum thermal efficiency through the use of a constant temperature of combustion in his engine cylinders, but as the abstraction of heat from the gases could not be effected at constant temperature, it was not possible to obtain the thermal efficiency of .855 which he expected and which would correspond to .25 pound of coal per horsepower-hour. In this connection it should be noted that the first trials were made with coal dust.

In the gas engine the heat is introduced theoretically at constant volume, the mixture being completely burned or rather exploded before the piston begins its power stroke. In practice this is not the case, and part of the mixture is added at increasing volume; this results in a loss. **In the Diesel engine the fuel is introduced comparatively gradually and the pressure remains almost constant, giving a flat top to the indicator diagram; but this is theoretical, and in practice the top of the curve is only approximately flat.**

One difference, then, between engines working on the Otto and Diesel cycle lies in the compression pressures used, the maximum pressure in Otto-cycle engines being 130 pounds per square inch, higher pressures giving rise to preignition; while in oil-engines of the Diesel type the pure air charge is compressed at a pressure of about 32 atmospheres, or almost 500 pounds per square inch, this being possibly due to the pressure of pure air only. The high pressure raises the temperature to about 700 degrees Centigrade, when, at the top of the piston stroke, the oil being injected meets with a high enough temperature to cause its ignition without a spark or hot tube. In the semi-Diesel engines the compression pressure is only one-half of that just cited, and ignition is by a hot bulb. Both types of Diesel designs are immune from preignition, a great advantage.

Up to the present most Diesel engines have been designed to operate on the four-stroke cycle, corresponding to the strokes in four-cycle gas engines. **But Diesel motors may also be constructed to work on the two-stroke cycle, by having a blast of air enter the cylinder at the instant the exhaust valve opens, whereby not only perfect scavenging is obtained, but also a full charge of pure air, which is then compressed.** Each down stroke is a combustion stroke. This type of Diesel motor is now making great strides.

The essential parts of a Diesel motor, whether working on the two or four-stroke cycle, are: A working cylinder containing a piston, the latter's connecting rod and crankshaft, water cooling for the cylinder, and an air valve, a fuel valve and an exhaust valve; furthermore, a fuel pump regulated by a governor and a high-pressure air compressor for atomizing and injecting the fuel. In addition to these members the two-cycle motor requires a low-pressure air-compressor or blower for supplying the scavenging air. The valve driving shaft in the four-cycle motor runs at half engine speed, in the two-cycle type at full crankshaft speed.

It may be added, in conclusion, that in the four-cycle motor the exhaust pressure is slightly in excess of and the intake suction slightly below atmospheric pressure, while in the two-cycle type very little time is left for exhaust and scavenge, and a much better torque than in the four-cycle design is obtained.—From a lecture of Capt. H. Riall Sankey, R. E., reproduced in the *Journal of the Royal Society of Arts.*

Foreign Constructions Designs and Practices

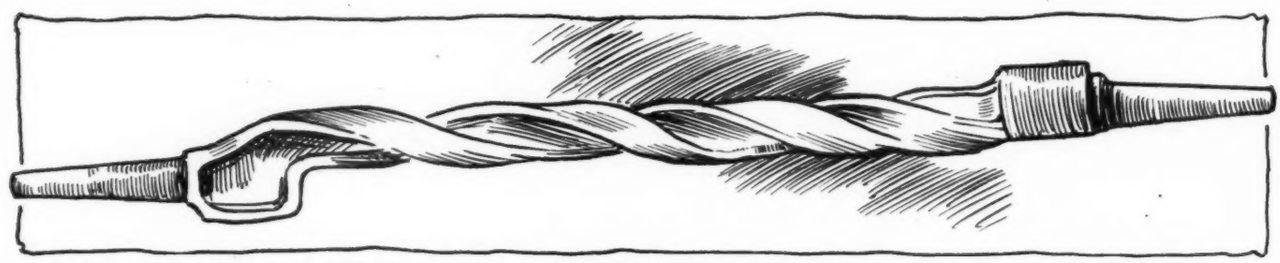

Fig. 1—Rear axle forging of chrome nickel steel after receiving nearly four complete twists in its length without showing distress of the fiber at any point

Steel Parts Must Be Thoroughly Tested Before Use—Samples Selected Are Tested to Destruction

STEEL as it comes from the mill is in the normal state so far as the purchaser is concerned. The steel, after it is rolled, is allowed to cool naturally. Annealed steel is the result of this process.

Normal steel then is an annealed product so far as actual practice is concerned, but when bars of normal steel are taken and used to make drop forgings, the steel must be subjected to a high heat and the forging process thereafter introduced may be looked upon as anything but gentle treatment. If the steel is required to assume an intricate shape demanding several forging operations, unless an annealing operation is introduced between successive forging operations the steel will be bruised and torn. Such forgings may look quite as good as they would were they properly processed.

Since it takes more time and adds more to the cost of production to anneal forgings during the forming process it is imprudent on the part of purchasers of forgings to take too much for granted. When the government contracts for forgings, a government inspector is always present at the forge and little by way of slighting the work is permitted by him. In the process of making automobile forgings instead of having an inspector on the ground reliance is placed on the integrity of the forger. In most instances the results are not such as will reflect adversely upon the forger's honesty and skill, but instances of poor results are too frequent to warrant disregarding the precautions of which the government takes the fullest advantage, even to the extent of sending several inspectors, rather than to depend upon the vigilance, skill and honesty of a single inspector. **In a word, the government does not expect too many accomplishments in a single man.**

The inspection of drop forgings for the purpose of locating faults such as seams and fissures is a difficult undertaking. If the plant wherein the forgings are made is operated for the avowed purpose of turning out none but good sound forgings the operation and annealing process will get good attention and inspection will be frequent.

The final inspection may take place after the forgings are sand-blasted, the idea being to uncover any faults that may be hiding under the scale which forms all over the surface during the forging process. But if the policy of the forger is to make forgings on a commercial basis, if an electric or autogenous welding equipment is a conspicuous part of the plant equipment, then every fissure or other faults will be plastered with soft iron; and, too, in a plant of this character, since the management exhibits a rare type of honesty, the workmen sit back on their haunches, slighting the processes to save their backs.

If common prudence demands that forgings be critically inspected before any work is done upon them in the machinery process, the question is, how is this inspection process to be conducted? If a laboratory is at hand, test proofs may be taken from the parts and the physical properties of these test proofs may be determined. But this somewhat long and rather expensive process will scarcely serve the end. The test bar may not be cut from the weakest part of the forging.

Test Part to Destruction

The way to find the defect in a part is to test the part to destruction.

Every automobile after it goes into the hands of the purchaser is tested to destruction.

The reason why the purchasing public consents to be the laboratory of the destruction test is due to the promise advanced by the maker that the test will take 10 years to complete it. The purchaser desire to work, and diligently, too, for a period of years at the destruction test before reporting results to the maker of the automobile. But the average user is led to believe that all the incidental tests are conducted to completion in the maker's plant. In order, however, for the maker to approach the user's test to destruction of the finished product, it is believed that it is imperative for the manufacturer to make destruction tests of the parts—enough of them to inspire confidence—before the automobiles are assembled and sold.

Consider axle forgings: Not a few of them are welded at the middle. Were one of these welded axles subjected to the torsion test, as shown in Fig. 1, it would fail at the weld.

A test to destruction by the torsion process is simple to make. All that is necessary is to set the part up in a stout tool, as a back-geared lathe, and by turning over the tool slowly, usually by hand, twist the part.

A first-class axle forging will perform as shown in Fig. 1. Welded axle forgings will fail at the weld. Forgings of other parts will show equivalent characteristics. The torsion test, if it is applied to one in ten of the forgings offered, will tell the tale of success or failure so thoroughly that success will attend the effort and the cost of the tenth forging will be negligible. If one in twenty of the forgings is twisted the information thus afforded will be of great value. A test of even one in each 100 forgings will be of great value. But the test to destruction by torsion should be made by the purchaser of the forgings. It is not enough to permit the forger to respond to the occasion.

In one instance of testing to destruction, front axle forgings being tried, the first seventeen axles failed at the weld. On the other hand, an extra price of $12 per axle was paid to the forger to get one-piece axles in this case. It would have been far better to pay the lower price for welded axles, for then the metals selected for use would have been more suitable to welding. In this case of failure the steel was specified knowing that it would not respond to a welding process, but the selection was justified because the specifications required and stipulated that the axles were to be forged in one piece.

Referring to welds, they belong to a bygone day—the period of iron. Steel is not pure enough to serve in a welding process if good strength of the weld is required. **Even weldable iron when the weld is made at a temperature so high that good steel would be destroyed, offers nothing better than 82 per cent. of the strength of the unwelded section, and the range of weld strength for good weldable iron is from the maximum of 82 per cent. down to a minimum of 34 per cent. of the strength of the unwelded section for steel, and the better it is the worse it behaves in the welding process, the strength of the weld is too indifferent to be given a moment's consideration, referring of course to the blacksmith's weld.**

Referring to the autogenous weld, if soft iron is run in between the members to be welded it is self-evident that the strength of the weld cannot be greater than the strength of the soft iron. But even the soft iron will fall below its normal strength, due to the abuse to which it is necessarily subjected in the welding process.

A very simple torsion testing equipment is selected in Fig. 2. An old stout lathe with a hollow spindle was fitted with a second head in place of the tailstock. The hollow spindle at both ends came handy in crankshaft testing. The flange F of the crankshaft is butted on to the face plate and clamped there too by dogs, D. The last throw at the other end is shown dog fastened to the tail end face plate. The lathe was worm-geared to a slow speed electric motor.

This tool was used from time to time to twist all sorts of forgings. A standard for each type of forging was first established. **All forgings which fell below the standard were delivered at the laboratory for further and detailed investigation.**

—

Method for Coloring Metals

The separation of the oxides of iron, manganese and nickel on the anode from ammoniacal solutions of their salts was recently dealt with in an article in the *Elektrochem, Zeitschrift.* The object was to produce colored films on the surface of a metallic article.

For a good adherence of the film, it was found necessary that the surface of the metal used as the anode should be free from grease, polished and free from foreign matter. The removal of the grease is best effected in an electric cleaner containing an alkali carbonate or a cyanide. By this process saponifiable as well as unsaponifiable matter is removed, this holding true especially if the article which is to be covered is alternately applied to the two ends of the conduit immersed in the electrolyte.

The investigations were carried out with iron or steel anodes in all cases. Ferric axide and manganese dioxide can easily be deposited as adherent layers of varying color, and under suitable conditions the process may be of commercial value. This is particularly the case with the deposit of manganese dioxide which is produced with a voltage of from 1.75 to 2.5.

From ammoniacal nickel solutions the deposits produced are not as satisfactory. The conditions under which the precipitation takes place are very limited and difficult to control. The color is unattractive and the deposit adheres badly. The potential required for the deposition of the oxides varies considerably with the metal. In the case of iron, a deposit which consists of partly ferrous iron is apparently obtained with very small potentials. As the potential rises, the amount of ferric iron in the deposit increases. In the case of manganese, no oxide at all is deposited below 0.4 volt, and in the case of nickel, the formation of the peroxide seems to be closely connected with the production of molecular oxygen; and consequently it only appears at potentials which allow the evolution of gaseous oxygen.

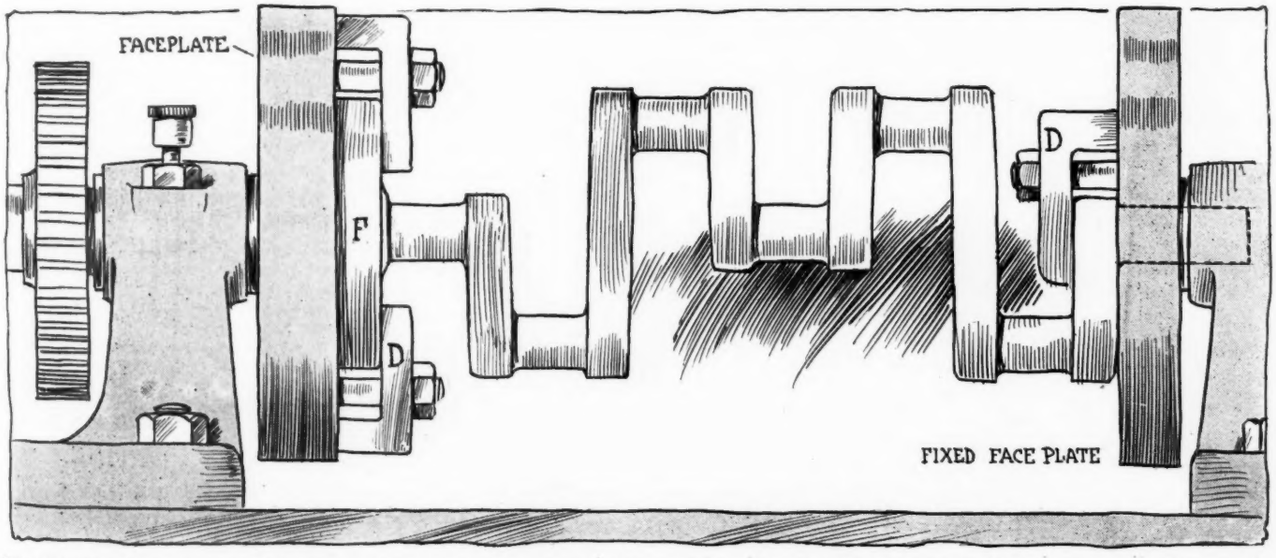

Fig. 22—Showing a crankshaft in an improvised torsion testing machine made out of old lathe, but which gives most satisfactory results in foreign shops

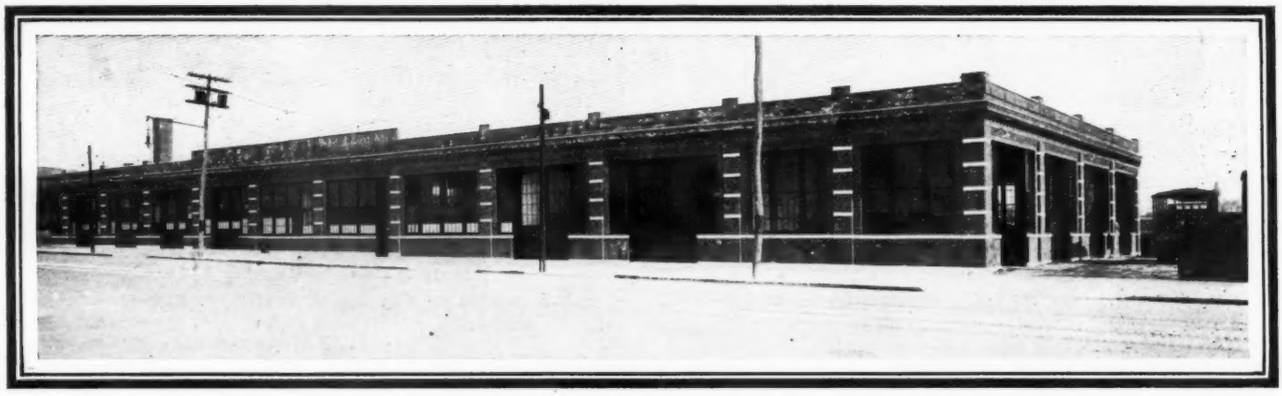

Fig. 1—Alco service building for metropolitan territory, located conveniently in Long Island City, L. I.

Alco's Metropolitan Service Building

Facilities to Serve Territory of 15,000,000—Three-Fold Nature of Plant Provides For Supplying of Parts, Repair of Cars and Trucks in District

GIVING complete and efficient service at lowest possible cost to the user of an automobile is the problem confronting the manufacturer-dealer today. Buyers are more and more demanding facilities for prompt supply and mounting of spare parts and adjusting whatever parts of their cars require to be adjusted, and they demand these facilities to be furnished at little or no expense to them.

Companies planning service departments for the territory of New York City and its surroundings are following up either of two possibilities in deciding the location of their service plants. One is to middle West Side of Manhattan, between Thirty-fourth and Seventy-second streets, which neighborhood is at present largely filled with tenements and flats; the other location is Long Island City and its suburbs, especially Astoria. While a number of large service departments have been placed in the section of Manhattan just mentioned, there is no doubt that the available space on the island which forms the heart of New York City is limited, it may even be said that if 10,000 commercial cars were to be used in Manhattan today instead of 4,000 now operating, it would not be possible at this moment to house them. Foreseeing future developments, many concerns are placing their service departments in the boroughs across the East River, thereby reserving ample opportunity for expansion in time to come. Nor should it be forgotten that real estate in Manhattan costs far in excess of what its price is in Long Island City.

To the group of service departments which has crystallized in the latter place during the past two years, another building of a representative company has been added early during this year. The newcomer is the department of the manufacturer of Alco cars, which is conducted jointly with the New York City branch of the Providence company.

The new service building, opened several months ago at Long Island City by the American Locomotive Company, covers a floor space of 315.33 by 98.66 feet and has a useful height of 15 feet, giving a total floor space of almost 31,200 square feet and a total volume of 468,000 cubic feet. For 9 hours every day ninety men work on the premises to repair pleasure and commercial Alco cars, to ship parts to machines in need of them and to carry on the office work necessary in this connection. The Metropolitan district, which embraces Greater New York, including Staten Island and Long Island, Southern Connecticut, and portions of New York State and New Jersey, with an approximate population of 15,000,000 souls, is served from this center of activity.

In constructing this department, the Alco company took every care in creating an establishment with all the manufacturing facilities required to keep cars going through years of service. Pursuing this plan, the construction of the building is as up-to-date as its equipment, and the method of operating it is part of the efficient line-and-staff organization for which the locomotive manufacturing company is famed.

Built for the Future

Facing Jackson avenue with a front of 282 feet and extending almost 100 feet toward the tracks of the Long Island Railroad, which passes hardly 60 feet behind the building, the service structure is bounded by an uncovered yard at its right side—looking from Jackson avenue—and by a similar free spot on the left, where the boiler room is stationed adjacent to and below the level of the building. The front wall, which, like the other three walls, is worked in red brick, is fitted with six double-section sliding doors, each of which is 12.5 feet wide and 15 feet high. In addition thereto a 4-foot door leads into the reception room whence visitors of the plant are conducted to the specific department with which they have business to transact. The wall facing the uncovered yard has four sliding doors of the same construction and dimensions as the front side. The other two walls are not interrupted by doors and, as reference to Fig. 3 shows, all the wall area excepting the structural supports is taken up by large windows which afford ample general illumination throughout the working day.

In a building of this size the selection of suitable systems for lighting and heating it is an important and not an easy problem. As to the question of illumination, electric light is, of course, the sole method applicable in an establishment of this kind, but it, too, offers a choice of various systems. Among the possibilities of arc, incandescent and Cooper-Hewitt illumination, the company chose the most widely used method, namely, the incandescent light. Throughout the building, tungsten electric lamps of the Mazda type are used, which are dropped from the ceiling by means of cables, much in the manner used in offices and garages.

To provide full utilization of daylight, the four walls of the

building are practically all glass, except for the structural supports; but these, as reference to the shop illustrations show, decrease the entrance of light very little. All the windows are composed of an upper and lower half each, which again consist of nine approximate squares. Not only do these windows permit of plenty of light to reach the benches and machine tool shop, but they also provide full light for the men working on complete automobiles positioned in the middle of the shop, a large skylight which extends also over part of the office-and-supply room section, is used. Another skylight serves to light the cloak room. Both skylights are shown by cross hatching in Fig. 3.

A similar problem as the selection of the best-suited lighting system is that of an advantageous method of heating the building during the cold season, hot-air and steam circulations being the options in this case. It was perhaps because the first-mentioned system, which is now finding its way into many factories, calls for equipment too large and elaborate for a service plant, that the company preferred the steam-heating system. A series of coiled pipes, which are laid along the walls of the building, form the passageways for the steam which is generated in the boiler room.

Structure is Fireproof

The building is largely what is generally referred to as fireproof, being all steel and brick, except the concrete floors, and save the substructure of the roof, which latter is made up of strong wooden beams. To increase safety against conflagrations, all the rules of the fire department concerning water, hose, pails and chemical extinguishers are being observed carefully.

All electricity is obtained from the central station which is located about 1-2 mile away from the Alco building. This electricity is used for lighting and whatever power is used in the building for driving the shop equipment as well as the ventilating fans which are stationed throughout the establishment. By this expedient, the boiler room is made to serve the heating system exclusively, which, of course, facilitates its operation and reduces the otherwise greater force of men needed in this portion of the plant.

The inside of the building is divided into three sections by two fire-walls, which extend from front to back wall. By this arrangement the three departments of the service building devoted to repair work, office and supply operations and storage, respectively, are effectively separated. These departments are dimensioned as follows: Repair shop, 146 feet wide and 89 feet deep; central section containing office and supply departments, 98 feet wide and 95 feet deep; storage or garage department, 36 feet wide and 98 feet deep; the depths being calculated as averages, as they vary from end to end in each department, due to the converging shape of the building along its longer dimension. The rooms formed in each of the three sections are separated from each other by partitions finished in oak.

Taking up the departments in turn, the repair shop with its 13,000 square feet commands prime attention. It is entered by trucks through the four sliding doors, already mentioned, and by individuals by way of a small door leading through the fire-wall, from the office department of the building. The shop department has a concrete floor formed with twelve pits provided for working under automobiles. In one corner it is lowered as a centrally inclined square which serves as a wash rack. The roof is of the horizontal type and is carried on a network of steel beams and a wooden substructure supported by three longitudinal rows of posts spaced about 20 feet from one another.

As the floor plan, Fig. 3, shows, ten of the twelve pits are located in two rows in the center of the repair shop and in alignment with the second and third doors. They are, therefore, arranged so that they are equally easy to reach from any part of the shop, without necessitating a great deal of space to be spared for passages. Each pit is 3 feet deep. Work on cars themselves is done in that portion of the shop which is shown by dotting in Fig. 3 and which comprises more than three-fourths of the floor space. The only portions of the shop where no cars are placed are a long and narrow field extending

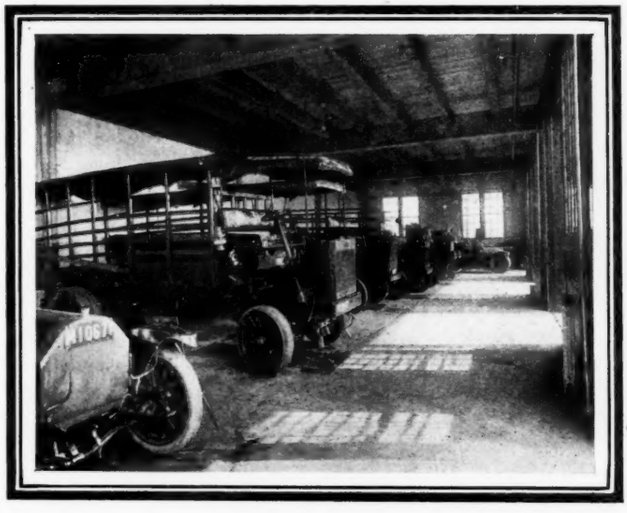

Fig. 2—Interior view of the garage where cars and trucks stopping for quick repairs are stored

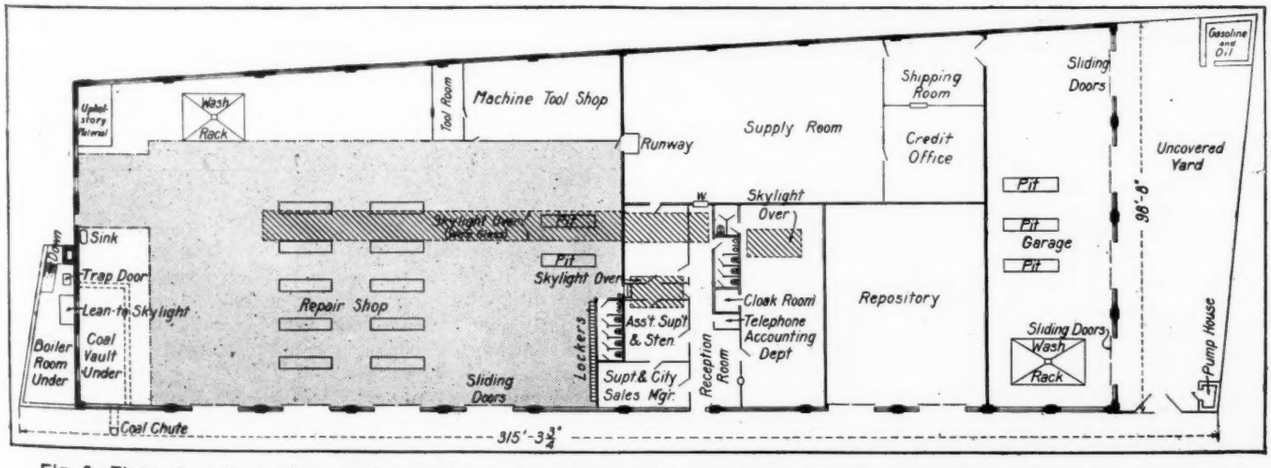

Fig. 3—Floor plan of new Alco service building in Long Island City, showing the division of the brick building into three departments, serving as shop, office and supply room, and garage, respectively. The shop is shown by dotting, while the cross-hatching denotes skylights supplying ample access of daylight throughout the building

Fig. 4—Inside of machine tool department of the repair shop which is equipped with every desirable facility

along the back wall of the building as well as the left front corner. The first-mentioned portion holds the machine-tool shop and tool room, as well as the benches, wash-rack and upholstery-material storeroom. The corner at the left end of the building front contains the forge, which forms the principal part of the blacksmith shop.

The machine-tool shop is separated from the rest of the shop by a screen partition; another partition divides it into two sections, the larger of which contains the machine tools and the smaller one the tools proper, which are used in the machine tools and in bench work. The entrance is by way of a door leading from the main repair shop into the machine tool department, whence another door opens into the tool room. A window between the latter and the bench department permits of handing tools out and in between that department and the tool room.

Equipment of the machine-tool department consists of a large and a small lathe, several drilling machines, drill presses, grinders, emery wheel, arbor press, planer, shaper and a few other shop tools. These tools are all very neatly arranged, as Fig. 4 shows, and they are driven by belting from shafts extending along the back side of the repair department. One motor is used to drive the shafts, it being located halfway between the tool room and the wash rack. Close to the motor and driven by the same an air compressor is mounted on the cross-beams carrying the roof, being connected to two tanks having a combined volume of 30 cubic feet, approximately.

In the left front corner of the machine tool shop the foreman's desk is in place. Outside of the screen partition and directly in front of his station is the recording clock and the time-card rack. Fig. 3 also shows a door, the upper hall of which is formed as a window, between repair shop and supply department, also located in close proximity to the foreman's quarters. Farther in front along the same fire-wall, the lavatories and workmen's lockers are arranged.

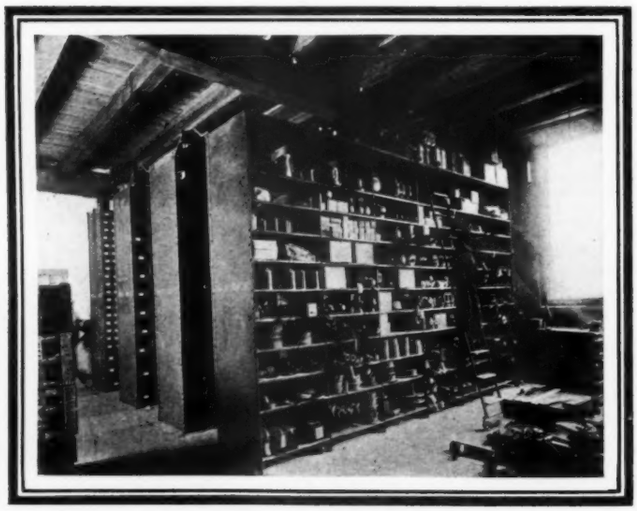

Fig. 5—View of sheet-metal shelving in stock room of Alco service building, Long Island City. This room will hold $80,000 worth of parts

Shop Has Two Main Sections

The central portion is divided all along its length into two sections, the front being the office department, which is 49 inches deep, and the rear the supply room having a depth of 46 feet. The office section in turn is subdivided into manager's, stenographers' and telephone department, accountants' office and repository for supplies used in the building. The cloak room is located adjacent the telephone switchboard. The passageways and doors are clearly shown in Fig. 3.

The supply room contains $50,000 worth of stock. Its details appear in Fig. 6, showing the floor plan and arrangement of the contents of the room. The supply room, as situated between the two fire-walls and the lengthwise partition separating it from the office department, has one door piercing each of the fire-walls and one through the partition. The door between the supply room and the repair shop, as has been stated before, is formed as a window through which materials may be passed from the supply room to the shop. A second window of the same type is shown at W, opening into the extension of the reception room. The equipment of the supply room is arranged in a very advantageous manner, the shelves containing the repair-part stock being located in six double-shelf rows directly in front of the window between supply room and shop, while the heavier parts, such as motors, wheels, materials coming in sheets, bar stock, etc., are orderly arranged between the last shelf row and the right subdivision of the supply room which contains shipping and credit departments. The shelves are of a standard multiple-unit steel design, and besides the four double rows mentioned, another row is located along the partition between this room and the office, and these shelves are used to store tires and their parts. Rims are assembled in a group in front of these shelves and radiators form a similar group. The location of the supply-room clerk's desk and of his files is also shown here.

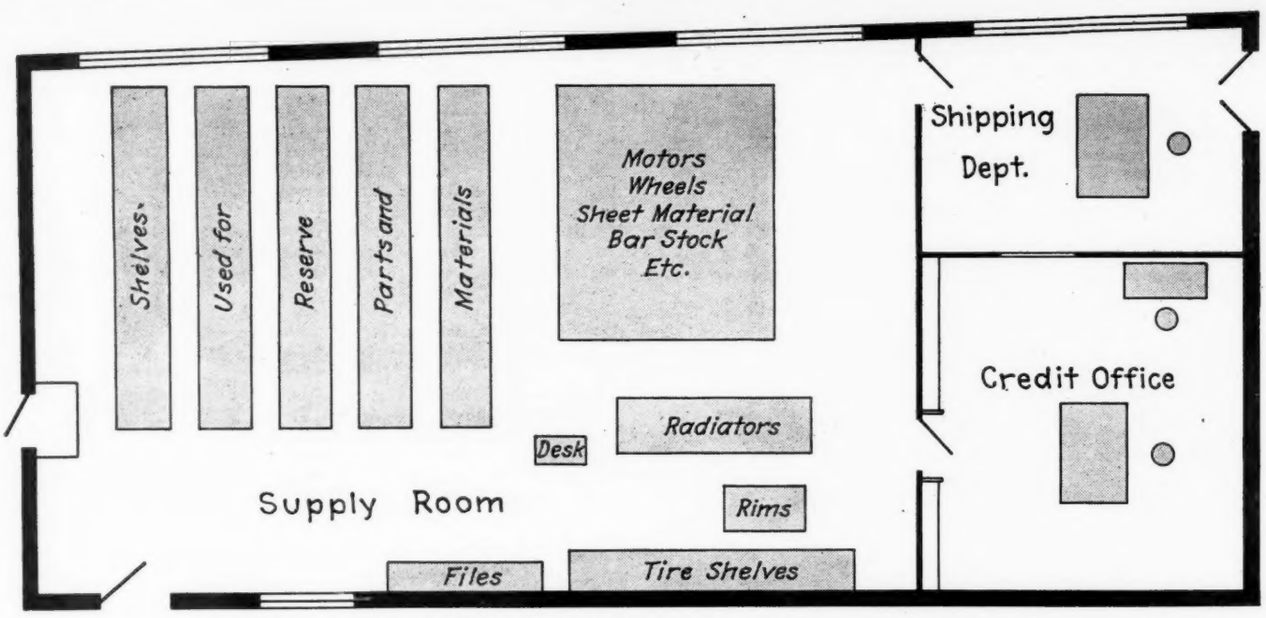

Fig. 6—Floor plan of Alco stockroom, showing layout for storage of various parts

Parts returned to the company are delivered to the credit office before going back to stock, while outgoing parts are recorded and charged by the shipping department. Since the business of these departments is closely interwoven with that of the supply room proper, their location in immediate proximity of the stock is a good stroke of efficient arrangement work.

The repository, which is also part of the central section of the building, serves for storing cars that remain at the service department for some time, either before or after being repaired. In this department is also kept the overflow of supplies from the supply room proper. The two sliding doors leading to Jackson avenue and the interior doors, inside the building, appear in the floor plan, Fig. 3.

From the shipping office, the only door between the central and the right-hand section of the building leads into the garage. The latter serves as a stopping place for the companies' cars which commute from Manhattan as well as for cars which have been repaired and are just about to be delivered to their owners. The garage is 36 by 98 feet in size, and is equipped with three pits of the same size and shape as the repair-shop pits. The three doors leading into the uncovered yard, which has a width of 30 feet, permit of free entrance and exit of the cars in the garage. In the front portion a large wash rack is provided, above which washing apparatus are fitted.

Certain parts of the equipment of the service department are stored outside the building, principally for reasons of safety, but also to save space inside the walls. Among these units is the boiler room shown in the floor plan, at the left front corner of the building. The boiler is stationed underground and is located next to the coal vaults which are charged from the street.

Ninety persons constitute the force which is employed in the entire service department. Two-thirds of these, or, to be exact, sixty-two men, work in the repair shop; the latter are ordinarily distributed about as follows: Five men on benchwork, from eight to ten men in the machine-tool shop, four doing blacksmith work, and the rest operating on the floor of the shop. In the supply department about six men are constantly employed, while the garage requires the services of two men. The boiler-room attendant, doormen, gasoline-tank man and about eighteen men in the office make up the rest of the force.

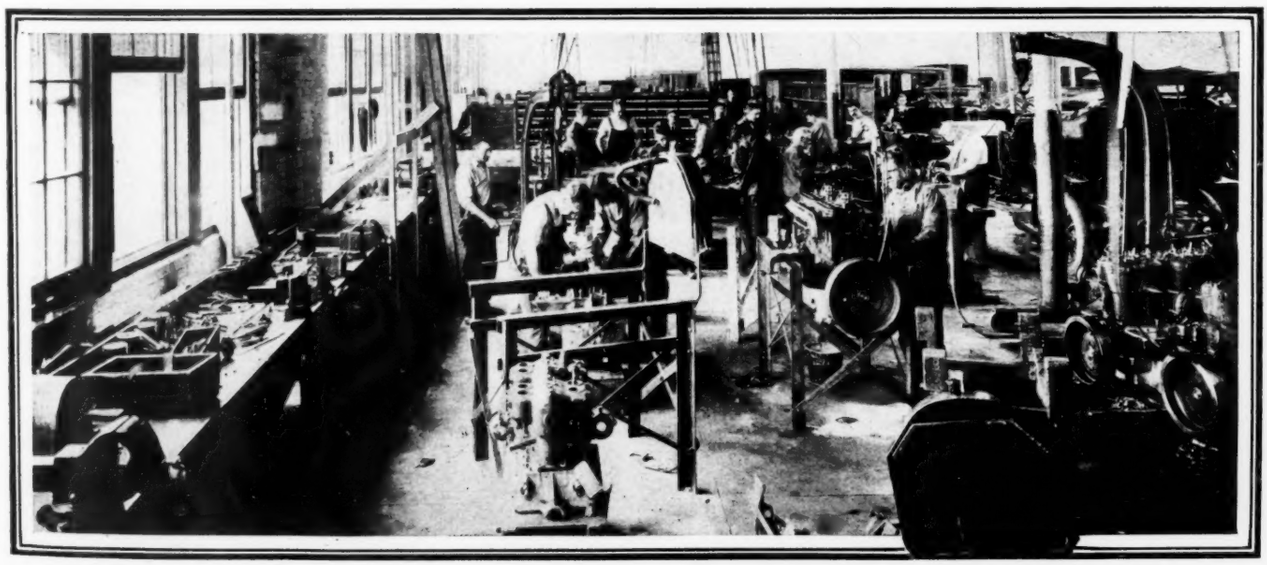

Fig. 7—Bench-room department of repair shop at Alco service building

Automobile Frame Steel

Heat-Treatment Applied to Straight-Carbon Steels of Suitable Composition Greatly Enhance Their Value

Many Manufacturers Should Give More Attention to Their Frame Specifications to Insure Durability

Paper presented by C. M. Hall, Sales Manager of the Parish Mfg. Co., at a recent meeting of the Detroit Section of the Society of Automobile Engineers.

IN order to fully understand the factors entering into the choice of materials of construction of the automobile frame it is necessary to consider the following points: First, the relation of the type of frame design of the material; second, untreated steel as against heat-treated steel; third, the dynamic strength of the steel.

Automobile frame design may be broadly divided by the manner in which the shocks and strains caused by bad roads and by the vibration of the engine are to be absorbed. The material to be used will depend upon this design to a very large extent. The shock and vibration may be (1) deadened; (2) overcome by mass; (3) mitigated by springiness; (4) absorbed by sturdy construction. The first class makes use of a wooden frame, the argument of the manufacturer being that the wood kills or deadens the vibration. With the increased size the strength demanded by the greater load and power of the new cars, this material has been very nearly eliminated from the field, and does not pertain to this discussion.

The second class may be likened to the bed of a heavy planer or milling machine. The mass of the frame is so large and heavy in comparison with the vibration that the automobile negatives the latter. Such is the argument of the manufacturers of this type of car. In general, we may say that the first class is prone to weakness, while the second class is characterized by an extremely heavy or unwieldy car, necessitating additional driving force. Both of these divisions are now in the minority.

Frames Are Often Springy

The third class may be best described by the following incident: A party was riding in an automobile of this class with one of the company officials. While passing over some street car tracks the front wheels caught in the track. The front part of the frame was twisted out of line for the moment, but upon the release of the wheels it sprung back into alignment. The official remarked that the incident explained the principle of the design of the frame of that particular car; that is, springiness. This class is generally characterized by a light frame, with the side bars usually of small section. In order to make this design at all feasible under hard running conditions the steel should be of the very best—heat-treated alloy steel. Only too often is this requirement disregarded by the manufacturer. As the major portion of the strains to which the frame is subject enters through the hanger end of the side-bars they reach the front cross-member practically unimpeded. As the cross-member acts as a stay, or brace, at this point, there must necessarily be a focus of the separate forces at this section of the side-bar. This results in a tremendous strain at this point. If the section is not of sufficient size, nor of suitable steel, a break results. This is not a rare, but a common occurrence.

The fourth class is generally typical of the larger and higher-powered cars, which have what we may term sturdy construction. The side-bars are of suitable section, and usually of heat-treated, chrome-nickel steel. The frame is substantial, but not unwieldy, the higher physical properties of this particular steel making an extremely heavy frame unnecessary. The shocks are to be entirely absorbed by the springs and frame, so that only a very small proportion shall actually reach the body of the car. Engineers are divided as to the relative merits of these last two classes, as is shown by the numerous automobiles of each type. But whichever of the two is used, the character of the steel entering into the frame construction must be carefully considered. As will be shown later, alloy steel without heat-treatment is of little value, while heat-treatment applied to straight-carbon steels of suitable composition greatly enhance their value.

The motor truck is now entering the market in a most aggressive manner, so that mention should also be made of it. The design of a suitable frame for a motor truck is a much simpler affair than that of the pleasure car. Leaving aside the actual design, the two important features to be considered—as far as the materials of construction are concerned—are the use of the I-beam or of the heat-treated channel section. Metallurgically, there should be no hesitation at all as the former cannot compare with the latter. The rolling mills of many steel companies producing these I-beams and rail sections aim for quantity rather than for quality. The steel is generally crushed down to size with as few passes through the rolls as possible, giving a structure which is absolutely unfitted for the use in view. Among the manifold causes of failure there was shown in New York City last winter the crystallization set up by cold weather and its disastrous results. Although no steel will entirely resist this tendency to cold crystallization, the structure of heat-treated steel is such that the influence of cold is many times less upon it than upon the coarsely crystalline I-section.

A decade ago, when the automobile steel frame was in its infancy, cold-rolled, low-carbon Bessemer steel was the only metal on the market for this sort of construction. This steel generally analyzed from 0.07 to 0.10 per cent. carbon. From this statement, however, it must not be assumed that such steel was ordered to specifications. Far from it. Indeed, in the eyes of the automobile manufacturer at that time, steel was simply steel. Then, with the ever-increasing ascendency of the open-hearth process and the decline of the Bessemer process, open-hearth, cold-rolled steel was specified. The steel mills, using the argument of the better quality of the open-hearth steel, increased their profits charging $2 or $3 more a ton for their steel if open-hearth was specified; otherwise the purchaser probably was given open-hearth steel anyway. Prices were soon equalized, however, and at the present time all sheet steel used in automobile frames is open-hearth. (There are only four Bessemet sheet mills now in operation in this country.)

Cold-rolled steel was specified at first simply for the bright finish obtainable. Having obtained this foothold, for many years its was practically the only steel in use. With the lowering prices 2 years ago hot-rolled steel came into use, and will probably supplant the cold-rolled material within a short time.

The growth of the steel frame business was somewhat hampered in the beginning by the difficulty experienced in obtaining sheets of sufficient length and width. The sheet mills were formerly rolling at a maximum width of some 8 inches, while a frame of 100 inches in length was considered large. Educational methods have now resulted in sheets double the width, while a side-bar requiring a 350-inch sheet is not at all unusual.

With the increasing weight and size of the car came the demand for a better and stronger steel. This requirement was filled for the time by the use of a higher carbon steel, giving an elastic limit of some 30,000 pounds per square inch. Then, in 1905, came the revolutionizing process of using alloy steel, together with a suitable heat-treatment, with the formation of the Parish Manufacturing Company, at Reading, Pa. This company experimented with various types of nickel, chrome-nickel and manganese steels—heat-treated—which resulted in the present types of chrome-nickel steel and special carbon steel now used by them. The true worth of this chrome-nickel steel as against carbon steels may be appreciated by noting the dynamic strength and quality figure given in the last part of this article.

Selection of Steel for Frame

The problem of selecting the proper steel for an automobile frame is an all-important one, for upon the strength and proper construction of this frame will depend the safety and lives of the automobilists. Moreover, a faulty frame necessarily results in a useless machine. A large part of the frame troubles probably never reach the ears of the manufacturer. The owner of a broken frame will often have it repaired in some crude way by a blacksmith rather than forego the use of his car for some weeks. If the automobile manufacturers were aware of, or would admit, the large percentage of frame failures they would pay more attention to their frame specifications.

The steel must be chosen with a view to the metallurgical and mechanical treatments in mind, and with due regard to the peculiar conditions to be met with in finished car or truck. It is well known that various elements, such as carbon, manganese, phosphorus, sulphur, etc., affect steel in divers ways. Some are injurious; others confer added elasticity, hardness or toughness and increase the efficiency of the steel for certain usages peculiar to automobile frames. In short, this means a special steel, which upon further treatment will be the best for the existing conditions.

Metallurgists will tell the uninitiated that raw steel resembles granite, in that it is made up of innumerable crystals, often too small to be seen with the unaided eye. A little thought will convince one that the qualities and properties of the steel will be directly dependent upon the size and arrangement of these crystals. The closer the crystals interlock with each other, the

stronger the steel. Also, the smaller the size of the crystals, the greater the number of crystal faces which will fit into each other. Upon this internal structure will depend the physical properties of the steel. The control of the structure—assuming a proper chemical composition—is vested in the metallurgical treatment which is given the steel. Chemical composition—special steel—must go hand-in-hand. One is useless without the other.

This heat-treatment is not to be a hit-or-miss affair, but must be conducted rationally and in a technical manner under the direction of a competent metallurgical engineer. For each heat of steel a separate treatment must be worked out. Steel of high quality—and such only should be used in frame construction—is very susceptible to a few degrees of heat at high temperatures. This is easily demonstrated by the use of a testing machine in conjunction with accurate pyrometers. Heat-treatment such as should be used in connection with the heat-treatment of automobile frame steel must be most accurately adjusted and carried out. This, of course, will necessitate very careful work on the part of the metallurgist and of those under him. The results obtained will amply justify the efforts expended. Heat-treatment in general is as yet in its infancy, but specialization in this particular branch of metallurgy will have a rapid growth.

Let us consider the effect of heat-treatment properly adjusted upon the frame steel. A strip of straight carbon open-hearth steel was pressed into a channel. Photomicrographs were then taken of a section of this channel. This steel is characterized by the laminations given it by the rolling operation; by very coarse crystallization (inherent to raw steel); and by lines of weakness due to the crushing of the crystals in the forming operation. That is, the steel is so strained and stressed that it is wholly unsuited—in its present condition—to frame conditions. And yet many manufacturers persist in using such steel and wonder why their customers complain that the frame is unsatisfactory!

The channel was then heat-treated by the Parish process and photomicrographs taken of the same section. A great contrast between the untreated and the treated steel was observed. A fine, even grain has replaced the coarse crystallization and all signs of weakness have been obliterated. The working strength (elastic limit) of the steel has been nearly doubled, as is shown by the following results:

	Untreated	Treated
Elastic limit, lbs. per sq. in	28,950	57,300
Tensile strength, lbs. per sq. in	50,600	85,000
Elongation, per cent in 2 in	37	28.25

The effect of using untreated stock for frames is that the structure of the steel is very uneven and shows much weakness. Many other examples illustrating the advantage of heat-treated steel over untreated steel might be given. From both the technical and practical point of view, heat-treated steel—of suitable composition and physical properties—has no equal.

An automobile frame is subject to two general classes of stresses: static and dynamic. By static stresses are meant the weight of the dead load, such as machinery, body, passengers, etc. It is upon this total load and its distribution that the design of the frame with its component members is usually arrived at, allowing for a certain factor of safety. But there are also other extremely important stresses to which the automobile frame is subject on account of its inherent make-up and which are too often neglected in selecting material for the frame. These stresses are set up by the vibration of the engine and by the constant bumping on uneven ground. The latter may be partly or wholly taken up by the springs, but the former can but pass into the frame itself. These continual shocks and alternating stresses, though primarily small in amount, soon play a very important part in the life of the car. To these complicated kinematic forces and fatigue-resisting power are given the name of dynamic stresses. That these are not a direct function of the static strength is shown by numerous every-day failures in all lines of steel construction, and which cannot be attributed to any other cause by dynamic weakness.

—

THE RULE for finding the piston displacement of a motor cylinder is that of finding the cubic contents of a cylinder, which is as follows: Multiply the area of one end by the length of the cylinder, the product will be the cubic contents of the cylinder. The rule for finding the area of a circle consists in multiplying the square of the diameter by .7854. The formula for finding piston displacement is: $D^2 .7854 S N =$ piston displacement, in which D is the diameter of the cylinder, S length of stroke, N number of cylinders.

Therefore, to find the piston displacement of a motor with 5-inch bore, 6-inch stroke and four cylinders, substituting the numbers for the letters of the formula, it would read: 5^2 (five square) $\times .7854 \times 6 \times 4 = 471.2$ cubic inches.

Modern Repair Service

An Outline of Its Functions and a Standard on Which Departments May Be Organized

Every Man's Work Must Be Laid Out and Clearly Defined to Permit of Efficient Operation

From a paper by C. Roy Watson, published in the September Bulletin of the Society of Automobile Engineers.

THE function of the car service department is to take care of the cars after they are sold; to supply repair parts; educate repairmen; supervise the character and extent of agents' repair shops and policies; settle claims for defective parts, and operate a local branch for repairs, etc.

DUTIES OF THE CAR SERVICE DIVISION

ORDER DEPARTMENT.
General foreman of car service

(1) Records, lists, prints, etc., of parts, tools and material. Pricing
(2) Ordering, accounting and maintenance of repair stock
(3) Correspondence
(4) Ordering of shop. Outside repairing and work

A Repair stock...
(1) Manufacture and storage of repair parts.
(2) Handling, packing, shipping.

B Claims
(1) Receiving and cleaning of specimens.
(2) Investigation and judgment.
(3) Storage.
(4) Adjustment, allowing stock or credits.

C Educational N.
(1) Class room. Models. Car and instructor.
(2) Compiling of instruction book. Educating agents' men. Answering technical queries, and directing apprentices in repair and shop work.
(3) Traveling repair organizer and overseer.

D General repairs.
(1) General repairing and overhauling, shipped in from outside.

ORGANIZATION OF CAR SERVICE DIVISION

General foreman of car service division

(1) Order clerk
(2) Stenographer
(3) Stenographer

A Repair stock foreman
(1) Manufacturing foreman.
(2) Stock renewal man.
(3) Order clerks.
(4) Order checker.
(5) Packer.
(6) Shipper.

(3) Records man
(4) Accountant
(5) Typewriters
(6) Errand boy

B Claims foreman.
(1) Clerk.
(2) Handyman.

C Instructor
(1) Traveling overseer.

D Repair shop foreman
(1) Repairmen.
(2) Repair apprentices.

A—Repair Stock.—The main requirements in connection with the repair parts stock are that the parts be reliably and promptly supplied, properly ordered, equitably priced, and interchangeable. Two or three sub-stocks for storing, at suitable shipping distance, are necessary for promptness, as very few agents can finance a complete stock which in several cases runs as high in price as $50,000.

As time passes and men whose minds are storehouses of facts leave, the lack of thorough records, generally neglected in the rush days of the industry, calls for a thorough supply of drawings, lists and records of supersedence, interchangeability, etc. All the plans, tools, and a wisely estimated stock of the special materials and intricate process, parts and assemblies made by outsiders should be bought and stored when it is suspected that the supply of such repair parts will be neglected or stopped in the future.

B—Claims Department.—The claims department of an automobile factory is distinctly an item of expense, but a necessity; and when equitably and diplomatically managed makes a quiet bid for happy loyal owners.

C—Educational Department.—The educational work is, first, to supply trained repairmen, and post agents and their foremen on new models; also to oversee and develop agents' repair shops to a high standard. Of course, this work is a direct expense, but when really productive pays indirectly many times its cost.

The instructor, a thorough man in both general information and the lore of the car, with teaching and managing ability, has a classroom with sectional models and a car.

Overheating During First Few Miles; Method of Adjusting the Schebler Model L; Tapping Sound from First Cylinder; Mercer Cars Are Overslung; How To Shift Gears Readily; Best Non-Freezing Solution

Engine Overheats in 2 Miles

EDITOR THE AUTOMOBILE:—I drive a 1911 Hudson 33, and I find in running the first mile or two the engine gets very hot, but on a long run it seems to be all right.

1. Can you suggest anything that would cause this or is it a natural consequence? The 1911 Hudson's fan is in the flywheel, that being the only cooling fan. Also, can you suggest any preparation that would tend to keep the temperature down in the engine, such as something to mix with the water.

2. Also, I would like to know what is a good thing to keep the water from freezing in the radiator, and is it necessary to use lighter oil in cold weather, or can the oil I am using be thinned down?

Hartford, Conn. S. F. FRENCH.

—1. This is a very strange case and the first time that THE AUTOMOBILE has heard of a motor that would overheat in 2 miles and be all right in 10. The overheat, since it is of such short duration, will not harm your motor and you may disregard it unless it becomes more serious. It might be that owing to your location you have to climb a steep hill when starting out or that you travel with your spark retarded too far. Keep your spark advanced as far as you can without permitting the motor to knock.

2. The answer to this question will be found elsewhere on these pages in answer to another inquiry. Do not attempt to thin down your oil. Medium cylinder oil will give you satisfaction. It is a big mistake to endeavor to thin down thick or heavy oil by adding oil of a lighter grade. The only place where it is safe to use mixed oil is in the gearset or the differential.

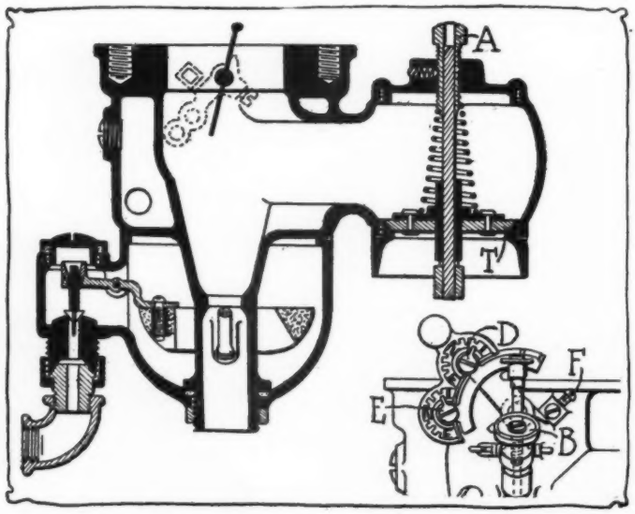

Fig. 1—Adjustment points on the Schebler model L carbureter

Adjusting Schebler Model L.

Editor THE AUTOMOBILE:—How can I adjust a new model L Schebler carbureter to my car so it will run well at all speeds? I have had the carbureter some time, but have never attached it as I did not know how the adjustments should be made.

Toronto, Canada. FRED. BLACKSTONE.

—First make sure that your ignition is properly timed, and that you have a good hot spark at each plug; that your valves are properly timed and seated, and that all connections are tight, and that there are no air leaks of any kind in these connections.

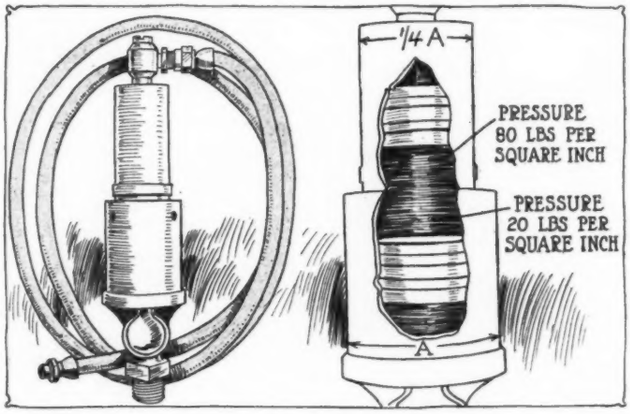

Fig. 2—Use of the differential piston, showing Mayo spark plug pump

Adjustments on the auxiliary air valve A, Fig. 1, are made first so that it seats firmly but lightly at T; then close your needle valve by turning the adjustment screw B to the right until it stops. Do not use any pressure on this adjustment screw after it meets with resistance. Then turn it to the left about a turn and a half and prime or flush the carbureter by pulling up the priming lever C and holding it up for about 5 seconds. Next, open your throttle about one-third, and start the motor; then close your throttle slightly and retard your spark and adjust throttle lever screw F and needle valve adjusting screw B, so that the motor runs at the desired speed and hits on all cylinders.

When a good adjustment with your motor running idle is secured, do not touch your needle valve adjustment again, but make your intermediate and high-speed adjustment on the dials D and E. Adjust pointer on the first dial D, from figure No. 1 toward figure No. 3, about half way between. Advance your spark and open throttle so that the roller on the track running below the dials is in line with the first dial. If the motor backfires with the throttle in this position, and the spark advanced, turn the indicator a little more toward figure No. 3; or if the mixture is too rich, turn the indicator back or toward figure No. 1 until you are satisfied that your motor is running properly with the throttle in this position, or at intermediate speed. Now,

open the throttle wide and make your adjustment on your dial E for high speed in the same manner as you have made your adjustments for intermediate speed on dial D.

It is found that in the majority of cases in adjusting this carbureter the tendency is to give too rich a mixture. It is suggested and recommended in adjusting the carbureter, both at low, intermediate and high speed, that you cut down the gasoline until the motor begins to backfire, and then increase the supply of fuel, a notch at a time, until the motor hits evenly on all cylinders. Do not increase the supply of gasoline by turning the needle valve adjusting screw more than a notch at a time, in your low-speed adjustment, and do not turn it any after your motor hits regularly on all cylinders. In making the adjustments on the intermediate and high-speed dials, do not turn the pointers more than one-half way at a time between the graduated divisions or marks shown on the dials. By following these instructions the adjustment should be satisfactory.

The Best Non-Freezing Solution

Editor THE AUTOMOBILE:—Will you kindly advise us of some chemical which you know to be good to add to the radiator water to keep it from freezing where the temperature never reaches zero.

Norfolk, Va. D. M. BELL.

—There are three well-known anti-freezing compounds which have been used extensively and which have proved themselves to be valuable for this work. They are alcohol, glycerine and calcium chloride. Besides these there are many others that are good, but they nearly all have some drawbacks that prevent them from being as useful as would otherwise be the case.

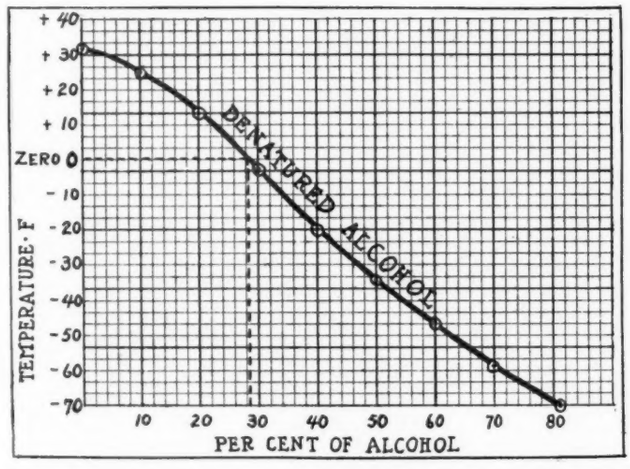

Fig. 3—Freezing points of various solutions of denatured alcohol and water

About the most popular of all the solutions to use in the motor is the alcohol. Wood alcohol or denatured may be used. The cost is small; denatured alcohol may be purchased for 60 cents per gallon and the price of wood alcohol is about the same. The advantages of alcohol are that it is very easily handled and that there is no action on the metallic parts of the circulating system. The denatured alcohol is especially perfect in this respect, while the wood alcohol has a tendency of developing formic acid under the influence of heat when in the presence of oxygen. Formic acid has a mildly corrosive action which will harm the metal in the radiator if the action continues for a long period of time. The danger of the formic acid, however, is so slight that only the most particular of automobilists need worry about any deleterious effects from its use.

The freezing point of the wood alcohol is lower than that of the denatured alcohol, as may be seen in Fig. 8. It would seem therefore, that less of the wood alcohol would be required, but the objection to this is that the boiling point is also less than that of the denatured alcohol and therefore more of it is required in order to counteract the evaporation. When wood alcohol is added to glycerine, however, in the proportion of half to half, the boiling temperature is raised considerably as will be seen in Fig. 7, which shows the boiling points of the pure wood alcohol and the alcohol and glycerine when added to the water at different percentages.

The specific gravities of the wood and denatured alcohol solution will also vary considerably and, although this is not an important feature in many respects, it may be brought out as illustrating another point of difference between the action of wood and denatured alcohol. It will be seen that the wood alcohol has the lower specific gravity as well as the lower freezing point for a mixture of a given percentage.

Taking wood alcohol alone the following solutions may be used:

Freezing Point	Wood Alcohol	Water
+ 5 degrees Fahrenheit	20 per cent.	80 per cent.
0 " "	25 " "	75 " "
— 5 " "	27 " "	73 " "
—10 " "	31 " "	69 " "
—15 " "	35 " "	65 " "
—20 " "	38 " "	62 " "

When using denatured alcohol the freezing point will be as shown in the diagram at Fig. 3. In tabular form for temperatures between 5 above and 20 below zero Fahrenheit, the denatured alcohol solutions will be as follows:

Freezing Point	Denatured Alcohol	Water
+ 5 degrees Fahrenheit	24 per cent.	76 per cent.
0 " "	29 " "	71 " "
— 5 " "	32 " "	68 " "
—10 " "	34 " "	66 " "
—15 " "	37 " "	63 " "
—20 " "	40 " "	60 " "

Glycerine possesses many characteristics which would seem to stamp it as the ideal non-freezing agent. The boiling point is high and, as will be seen in the diagram Fig. 7, does not change the boiling point of the mixture regardless of the percentage added to the cooling water. Glycerine reduces the freezing temperature materially when added to the water, but does not do so as rapidly as wood or denatured alcohol, as may be seen in Fig. 5. When reducing the freezing temperature to such an extent

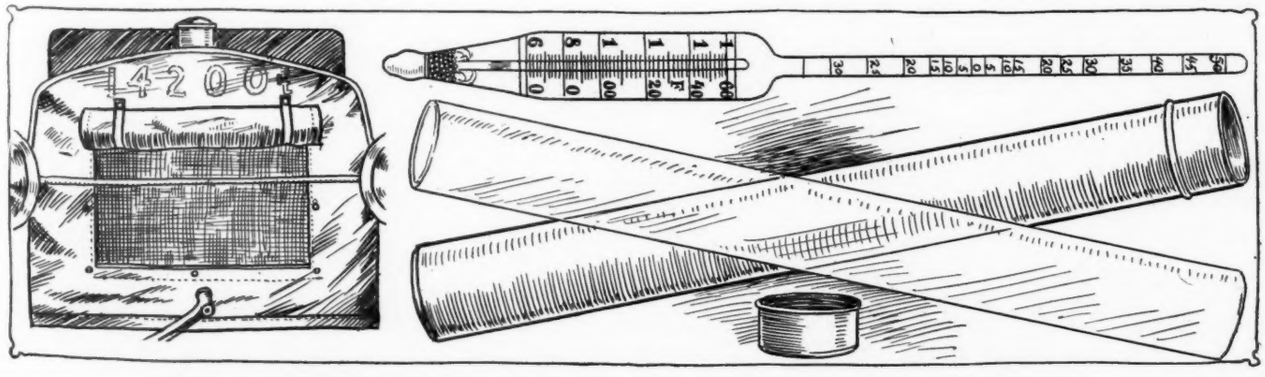

Fig. 4—Useful form of radiator cover; freezometer for determining freezing point of alcohol solution

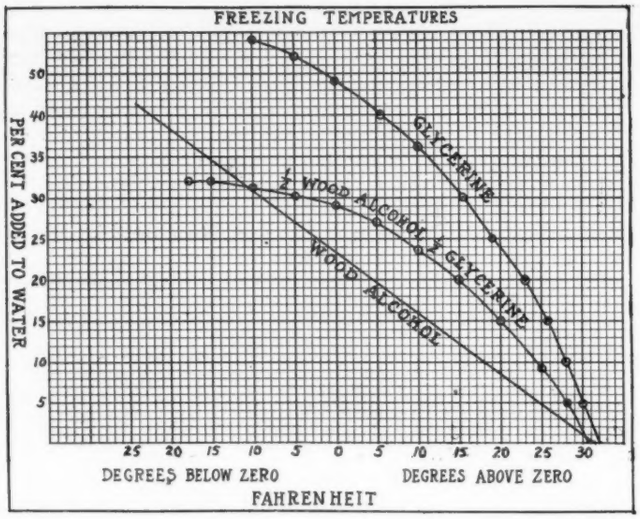

Fig. 5—Freezing points of glycerine and glycerine-and-alcohol solutions

that the water will not freeze in a cold climate it is necessary to add so much that the water tends to become gelatinous and for this reason it has been mixed very often with wood or denatured alcohol in a very successful attempt to combine the merits of the two. When glycerine alone is used the mixtures that are required for different temperatures will be found in the following table:

Freezing Point	Glycerine	Water
+28 degrees Fahrenheit	10 per cent.	90 per cent.
+15 " "	30 " "	70 " "
+ 5 " "	40 " "	60 " "
0 " "	48 " "	52 " "
— 5 " "	54 " "	46 " "
—10 " "	58 " "	42 " "

It will be seen from the above table and from a study of Fig. 8 that the enormous quantity of glycerine which has to be added at the lower freezing points will naturally stand in the way of the success of the use of this material where the climatic conditions are such that temperatures below zero will be reached. It is for use under such conditions that the addition of alcohol to the solution has been recommended by many, and which has become decidedly popular in the last few years. When the glycerine and alcohol are used together they are used in equal quantities. This mixture, which is purely mechanical, has not as great a tendency to rot the hose connections as a pure glycerine solution would have. It has more water in it than would the latter and is thus more free to pass through the radiator and other parts of the circulating system without doing harm. On the other hand, there will be less alcohol in this solution than there was in the pure alcohol solution and the result of this is that there will not be so much evaporation and necessary replacement of the cooling fluid after the motor has been run for a time. The glycerine and the alcohol are stirred up together and added to the water in the following proportions:

Freezing Point	Mixture	Water
+20 degrees Fahrenheit	15 per cent.	85 per cent.
+15 " "	20 " "	80 " "
+10 " "	24 " "	76 " "
+ 5 " "	27 " "	73 " "
0 " "	29 " "	71 " "
— 5 " "	30 " "	70 " "
—15 " "	32 " "	68 " "

A study of Fig. 5 will show that the freezing curve of this mixture drops off very rapidly toward the end. When a 32 per cent. mixture has been reached the line of freezing is almost vertical and a very slight change in the mixture will cause an enormous drop in the freezing temperature. It is remarkable that while a 30 per cent. solution of the mixture will have a freezing point 10 degrees higher than a 30 per cent. solution of the alcohol alone, still a 32 per cent. solution of the mixture will have a freezing point about 10 degrees below that of a 32 per cent. solution of the alcohol. When using the mixture the quantity of glycerine will remain constant for a couple of months, although the alcohol will have to be frequently renewed to make up for what has evaporated.

We now come to calcium chloride, $CaCl_2$, and water. This compound has been recommended by many and is very good, although it has its dangers in the difficulty of securing the chemically pure article. In buying the calcium chloride for use in the cooling system of an automobile the crude article costing about 10 cents a pound should not be purchased. The chemically pure article costs about 25 cents a pound and is very satisfactory. The objections to the use of the material is its tendency to set up an acidic action in the radiator. Chloride of lime, which should be kept out of the radiator, is often a constituent of the commercial calcium chloride and care must be used in getting the chemical from a reliable concern who will guarantee the purity of their products. With the calcium chloride solution the percentages are given by weight instead of volumes as are the other tables:

Freezing Point	Calcium Chloride by Weight	Water by Weight
+10 degrees Fahrenheit	15 per cent.	85 per cent.
+ 5 " "	17 " "	83 " "
0 " "	19 " "	81 " "
— 5 " "	21 " "	79 " "
—10 " "	22 " "	78 " "
—15 " "	23 " "	77 " "
—20 " "	25 " "	75 " "

In Fig. 8 the specific gravities of this mixture are given. These would be of use if the motorist had a hydrometer. He could then take a sample of his solution from time to time and test it for its specific gravity; from this he would know the freezing point which corresponds to it. He could then add more calcium chloride if it were necessary to lower the freezing point. For instance, if the specific gravity were 1.12 by looking at the curve, Fig. 8, it will be seen that the freezing point is 10 degrees Fahrenheit. There is an interesting instrument on the market called a Freezometer which is a hydrometer especially adapted for use with denatured alcohol. The readings are directly in terms of the freezing point. The appearance of the device is shown in Fig. 4. It is used as follows:

The scale in the stem of the Freezometer reads from plus 30, or 30 degrees above zero Fahrenheit, to —50, or 50 degrees below zero Fahrenheit, and indicates the freezing point of the solution tested. Take a quantity, either of the fresh solution before filling the radiator, or if a test is desired of that in use, draw from the radiator sufficient to float the Freezometer in the test tube supplied with each instrument. Put the Freezometer in the solution and read the line on the stem to which it sinks. This point will show the degree at which the tested solution will freeze, provided the thermometer, in the lower part of the body of the instrument, shows the temperature of the solution to be 60 degrees Fahren-

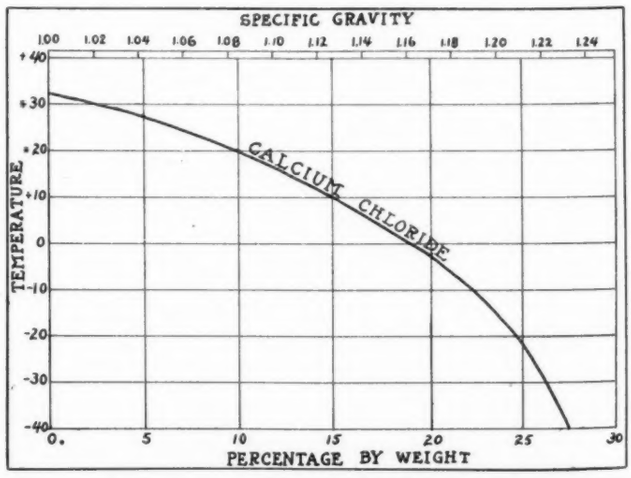

Fig. 6—Freezing points and specific gravity of CaCl and water solutions

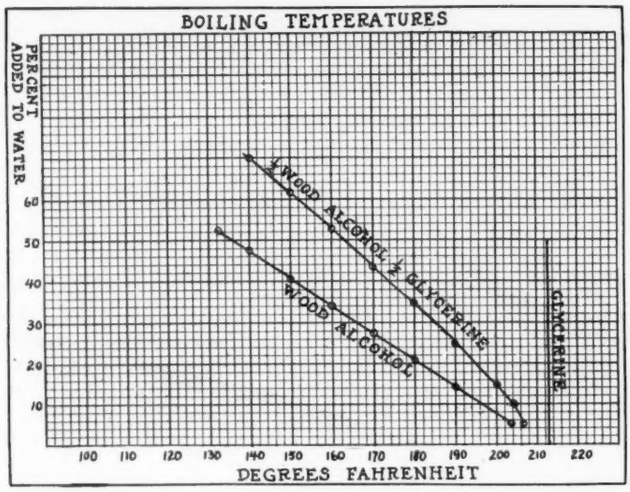

Fig. 7—Showing temperature of the mixture of alcohol and glycerine boils

heit when the test is made. If the thermometer shows a temperature below 60 degrees Fahrenheit hold the test tube closely in the hands until the solution is warmed up to 60 degrees, which will require but a few minutes, when the correct reading of the Freezometer can be taken. If the thermometer shows a temperature above 60 degrees Fahrenheit, the correction table, which is also printed on the reverse side of the thermometer scale in the bulb of the instrument, should be used.

The use of blankets over the radiator when the car is standing will keep it warm for a long time. The curtain-like device shown in Fig. 4 has been adopted by some. It is of very neat appearance and can be rolled up as shown in the illustration. Others place a sheet of newspaper across the front of the radiator permitting the suction of the fan to hold it in place and allowing the motor to run while the car is standing to keep the water continually warm. When leaving the car in a cold garage a cluster of electric lights placed beneath the hood of the car and a blanket thrown over the hood and radiator will often keep the motor warm for a long time while the owner is occupied elsewhere.

Any of the above devices will keep the water from freezing and they have all been tried and found all that has been stated above by numerous automobilists. There are no experiments in the above list of solutions, every one being practical.

Simple Way to Shift Gears

Editor THE AUTOMOBILE:—I have read with much interest the different means suggested for shifting from a higher gear to a lower one, all of which are practically the same except the different means used to obtain the result. I am of the opinion that the simple instruction to shift to neutral, allow the clutch to engage for an instant, throw out the clutch and instantly shift to the lower gear, all of which can be done in 3 seconds and on the steepest hill without any clashing of gears or material loss of speed, is the best instruction to give. This leaves the driver to learn from experience the required speed of car and motor.

San José, Cal. WILLIS.

Tapping in Front Cylinder

Editor THE AUTOMOBILE:—I am driving a four-cylinder gas car, one of the best makes. I have noticed for some time a tapping in one of the cylinders and have taken it up with the local people who have a good machine shop, but they do not seem to be able to get it out. I was speaking recently, with a view of purchasing, to the manager of one of the best make six-cylinder cars; he told me at the time that a tapping might be expected in a six-cylinder car, but did not mention a four-cylinder. He stated it was usually in the cylinder next to radiator, and caused by cold air striking the more exposed cylinder causing a contraction or expansion of the metal. Will you kindly advise me if such is the case and if there is any known way of taking it out.

Baltimore, Md. C. SUMMERS.

—The idea of air striking the cylinders and causing a tapping sound from any expansion, contraction or any other cause is absurd. The fact that the sound you hear is a tap and not a knock would seem to indicate that it is somewhat in the nature of a valve. In THE AUTOMOBILE for October 17 the adjustment of the valve was explained and it might be well to follow the directions given therein to see if this will eliminate the trouble. Should the tap still continue after the valves have been adjusted up as closely as they should go, look at the cam followers to see if they are worn. If so, the parts which are gone will have to be renewed. It very often happens that the exhaust will leak through an opening in the pipe with a sound that is sharp enough to be mistaken for a tap. The correction of this is obviously in closing up the opening. This will have to be done by the means which are best fitted to the particular case in point. If you are mistaken in the sound and it is after all a knock, look for a loose connecting-rod bearing, carbon in the cylinders, loose wristpin bearing, broken piston rings or loose main bearings. Sometimes a rapping sound is caused by the fan striking the radiator or by a broken circulating pump.

Mercer Cars Not Underslung

Editor THE AUTOMOBILE:—Will you please tell me how the Mercer cars are hung? I claim they are overhung and my friend says that they are underslung.

Hoping you will answer this, I remain,

Andover, Mass. J. D. CRARY, JR.

—The Mercer cars are not underslung, both the frame and the springs being above the front axle.

Use of Differential Piston

Editor THE AUTOMOBILE:—In a recent issue of THE AUTOMOBILE I noted a spark-plug pump which was condemned by the Editor because it did not use a differential piston. Would the pump have operated if such a device had been used?

Elyria, O. J. S. SMITH.

—The pump would no doubt have operated successfully as there is now such a pump on the market, it is illustrated in Fig. 2. It will be realized that the pressure follows the law brought out in the diagram in the same illustration. Total pressure divided by area will give pressure per square unit. Therefore since the pressure in any part of the vesel must be the same, when it is divided by a smaller area a greater pressure per square unit will result.

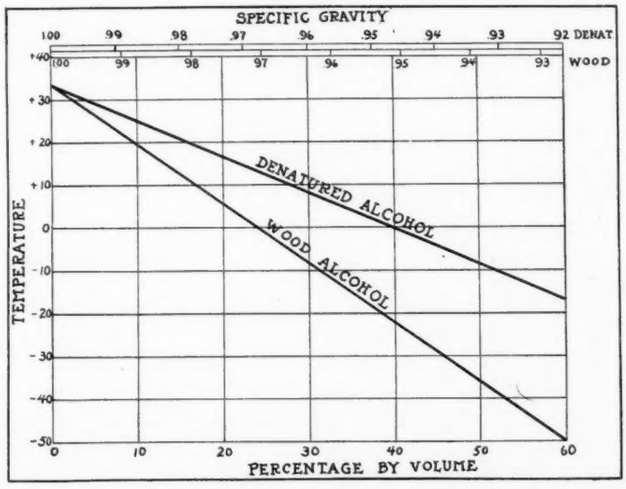

Fig. 8—Comparative chart of denatured and wood alcohol solutions

The Automobile

Vol. XXVII Thursday, October 24, 1912 No. 17

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Entered at New York, N. Y., as second-class matter.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Paraffin Motor Fuel

THE use of paraffin as a motor fuel instead of gasoline is receiving much attention in Europe today because of the excessive prices charged for gasoline, which during the last year reached the high mark of $1.12 per gallon. In a recent test a motor car was given an official run of over 2,000 miles with paraffin as a fuel but with provisions made to start on gasoline and switch to paraffin when ready, the switch being accomplished from the driver's seat as easily as turning from the battery current supply to the magneto in an ignition system. The test demonstrated that paraffin is a fairly satisfactory fuel: The engine after stops of 20 minutes was re-started on paraffin although it was customary to re-start on gasoline and switch to paraffin. The motor demonstrated flexibility by propelling the car for 1.5 miles at 6.14 miles per hour and also accelerating to 40 miles per hour in 51 seconds.

The Englishman in particular is quite desirous of seeing the paraffin carbureter developed; in fact, to such an extent that a public competition of paraffin carbureters has been called for and an American citizen living abroad has offered a prize of $2,500 for the best design. He is nevertheless somewhat skeptical as to how long paraffin will remain at its present low price. He has had a lesson during the last year on how the oil interests can advance prices when public attention turns to a certain product such as crude oil, which has more than doubled in the last 13 months since its consumption has been considerably increased by the more general introduction of the Diesel heavy-oil engines.

But the cost-of-fuel argument is not entirely confined to Europe; it has reached our shores and complaints are coming more from owners of high-powered cars than from the cheap-car owners. The complaints are being heard from those who are getting but 7 or 8 miles per gallon out of gasoline and not that much. Now that fuel is selling in metropolitan garages at 25 cents per gallon it brings the fuel cost alone for operating such a car up to over 3 cents per mile. The owner of the small light-powered car is getting 25 and 27 miles per gallon or an expense of less than 1 cent per mile.

There is no question but that the American car owner is going to face higher fuel prices during the touring season of 1913 and when that condition comes public attention will be focussed on the carbureter makers more than ever before. With them it will then be economy first. Up to the present the car owner and the maker, as well, have been demanding speed. Carbureter makers were demanded to make special adaptations of their stock product for different cars in order to get higher speeds, without any special regard to consumption. Now this is changing and already two or three American concerns have been abroad picking out the most satisfactory carbureters for the American field with the object of pushing their manufacture in this country. In nearly every case fuel economy is one of the big essentials of the foreign device.

That there is room for vast improvement in fuel consumption in America is admitted on all sides. Every engineer admits it, the car owners admit it, the carbureter makers admit it, all admit it. It would have been better today for the industry if the fuel economy tests of 3 or 4 years ago had continued and had developed as the hill-climbs, the road reliability runs and the road races. But makers scoffed at them. Who cares about fuel consumption? The bigger question was, could you go over 60 miles per hour and could you climb all hills on direct drive? But the lane is turning, and the owner who today is paying for his follies of 3 years ago is alert to what must be available a year or two hence and he is goading the car maker and the carbureter maker on. Both of these parties have made good in the past and there is not any reason why they will not make good in the future.

The necessity for carrying a supply of gasoline for starting purposes when using paraffin or other heavier fuels cannot be considered any difficulty in that the small tank capacity necessary for the gasoline supply can be made as a compartment of the standard fuel tank. Owing to the fact that greater mileage per gallon has been obtained from paraffin the net result is that with mixed fuels there is a greater fuel capacity in a given cubical space than with gasoline alone.

The present trends of attention towards heavier fuels again impresses the automobilist with the fact that while heavier fuels offer certain difficulties in carbureting, yet pound for pound, they give more power than the lighter fuels. The troubles in starting with heavier fuels in cold weather have been, to an extent, overcome by the self-starter.

Elbert Hubbard on Ideal Salesmanship

"When You Sell a Man an Automobile You Do Him a Benefit," One of the Messages in the Fra's Recent Address to the Convention of General Automobile Sales Association at Indianapolis

"WHEN you are out with very learned people, if you don't know what to talk about, just talk about electricity," he says. "You will never shock anybody. If you are out to a dinner party and there comes a little lull in the conversation, here is what you will say:

"'Electricity, speaking of electricity—of course it is not really what you are talking about. Speaking of electricity; that is the great mystery. Nobody knows what it is. All we see is its manifestation!' You are perfectly safe in saying that. If you don't know anything about electricity you will have to back up and sidetrack and start something else, but usually it goes all right."

And in the presence of that man, casting around in the vacuum which I am pleased to call my mind, seeking something to say, it came to me all at once: "Electricity, the great mystery, nobody knows what it is; all we see is its manifestations," and was just going to say it, when he said it himself! He beat me to it. "Good-by," I said, and I ran down the steps, caught a trolley car, jumped on the front end and over the head of the motorman I read a sign, "Don't talk to the motorman." That suggested an interview, and so I said: "Partner, what is electricity?" "It is the juice," he said. He knew. I said: "Where do you get it?" "Everywhere," he says; "it always was. Edison didn't invent it; it is God's best gift to man." I said: "I thought woman was God's best gift to man." "Same thing"—a great mystery. Nobody knows what it is. It is very dangerous if you don't know how to handle it." I said: "Does electricity make this car go?" "Sure," he said. I said: "Tell me how." He told me. I had not known before and I do not know now. I said "How do you know so much about this subject?" He said: "I have been taking an International Correspondence School course. I get $65 a month for holding down this job. I am going to have charge of the electric light station next month at $125 a month." I says: "I get off there at the corner," and the car stopped within a foot of where I wanted to get off and as I stepped off the car I said: "Good-by, my friend." He said: "Good-by, old man," but he never looked up at me. He was just intent on carrying that car through in perfect time, at proper speed and getting me off on terra firma. And as the car moved away I said to myself, "There goes an educated man. He is onto his job and he is getting ready for a better job."

If you don't like that definition of education, then you take the definition of President Eliot, of Harvard, who says that **that man is best educated who is most useful.**

Can you imagine a better man than a man who has a good job, who holds it down, and who is getting ready for a better job? You get your business organization going and the office runs on momentum. All you have got to do is to go along and look in once in a while, scare the boys a little, cut them down, fire a few and put in a few more, and the thing goes.

Not so with salesmanship. You deal with humanity. Humanity is a strange thing. Nobody ever got beyond the sky. You don't know what it is. Man is an electrical manifestation. That man, that motorman, was right. Man is an electric phenomenon, a generator. He takes up energy into his system and gives it off again. He is only here for a day. Life is motion. We are doing things, making things, interesting humanity.

Ten years ago it would have been impossible to have got this number of men together—men in competition with each other. We were all afraid of each other a few years ago. Ah! we had trade secrets. Now, here we are all together. I look into your hearts; I look into your happy, smiling faces, and I feel this afternoon here that there is but one atmosphere, there is but one feeling—brotherhood.

We come into life without our permission. We are being sent out of it against our will, and over the vision of our dreams there steals a thought that we have been used by an unseen power for an unknown purpose. We guess what that purpose is. We are here for a mutual benefit. We will not be here so very long. You help me and I will help you, and soon Death will come and rock us all to sleep. In the world where Death is there is no time for hate.

We are business men. We grow by elimination, by discarding things, and we know now as sensible men, leaving the question of ethics and morality absolutely out of the proposition, we know **the only way we can help ourselves is to help humanity. When you sell a man an automobile you do him a benefit.**

If you want to make money don't cut down expenses, but increase your income; increase your efficiency. And any man who owns an automobile is a better man than the one who does not. I say plunge; yes, mortgage if necessary to get the machine, and you will work out all right.

The other day I went into Tiffany's trying to sell them space in a magazine. Says the advertising man away down deep: "We are not selling any jewelry now. People are not buying any shiners." You remember how our old friend Hinky Connors, of Buffalo, launched upon the world an immortal epigram, to wit: "Them as has shiners wears them."

Now, the question is whether you will spend your money for shiners or automobiles. You are going to blow it in some way, anyway. So then I went to Sherry's and tackled their advertising man, and when I did he said: "The people are going out in the country." And I find it is so. I own a hotel. I feed the automobilists at a dollar a meal. We have them from one week-end to the other at East Aurora, and every Saturday and throughout the week. They don't go to the lobster palaces in the cities; they go to towns like East Aurora, where they can get a single meal for 75 cents—and the automobile increases the efficiency of the man.

Most of us go through life on one cylinder. We overeat. We underbreathe. We are full of hate and doubt and fear and apprehension, and the result is that we are about 33 per cent. sick 33 per cent. of the time. Anything that takes people out in the country, out away from the gases and noises and smells of the city, out through the green fields—that thing is a benefit; and so I repeat, when you sell an automobile you do him a benefit.

The man who buys the automobile and runs it gets his money's worth, and the man who makes one gets a profit on it always and forever, and the fellow who writes advertisements insists on getting his pay, but the **dealer is up against it a good deal of the time, and I think one reason is this: The dealer is isolated. He lives by himself. He is not in communication with other people. He does not get together with people in conventions like this.**

A convention like this enlarges your view. You get the perspective from both ends. You get acquainted with people. You get rid of your fears, your doubts, your grouch—and I want to see the dealers get together. I want to see a combination of dealers that will put the makers on their knees. I want to see you salesmen get what you are worth, and only a few of you do.

Everybody profits by good roads. I was delighted to hear the plea made for this road to run from the Atlantic to the Pacific. Why not? Do you know that in America we have only one railroad that runs from tidewater to tidewater? That is the Panama railroad, 46 miles long. It has one engine. I want to see an automobile road from tidewater to tidewater, and I expect to see it.

The proposition is a good one, that every automobile manufacturer should pay 1 per cent. of his gross income for a year into this project, and if they will do that this project will go through. I dont think there is an automobile manufacturer in America who can afford to stand out on that question. He will have to come in to save his face. This thing will go through.

Salesmanship Headwork

Boost All Products, But Boost Your Own Products Best Is the Theme of John G. Jones at Indianapolis Sales Convention

MAKING a selling talk is a hard job when you are talking to salesmen, but when you talk of four and six-cylinder motors surcharged with energy it is a dangerous job unless the rules of the game, the traffic rules, are obeyed. I am told that the one big problem of the dealer is in the making of profits from his distribution. I am further told that the manufacturers of the country are manufacturing today successfully and at a fair profit. There is a reason.

The manufacturers have found that they must do everything along scientific lines, and they are following the practice of sensible business methods. They have gotten down to as low an overhead as it is possible for them to strike.

Efficiency is prominent in every department, and the corelation of the various departments is one harmonious whole. That is why they are successful.

A great part of the trouble of the dealers has been in rebating or commission cutting. It is only poor salesmanship that must cut the advertised price for the good article. There may have been times when you were forced to give expensive joy rides to poor prospects. I believe that time is past. There may have been times when you would almost have to give the buyer the whole of the commission in order to get the game started and to get the people into the habit of using your product. But that time has passed.

There is no business man in the United States today, if he is approached by a real salesman imbued with the excellence and the value of his product, and knowing it from every angle, who is not willing to talk business. This convention is the keynote of a new era in the management and conduct of the dealers' organization.

Dealers must realize that they, as well as the manufacturers, must have efficient organization; but it is up to the manufacturer to help the dealer; not only to help him in the way of giving him supplies and sending an efficient salesman around to visit him and to give him the talking points of his special product, but it is up to the manufacturer to get a central body. I would suggest that the 419 manufacturers in the United States to-day get together and take up the problems, not of each individual manufacturer, but the problem of the distribution of the automobile.

The bankers are training young men in their ranks all over the country in the economics of banking, in banking principles, in commercial law, in corporation finance, and they are doing it by a standardized course. I think if the 419 car manufacturers would put up $50 apiece a year they would be able to have an organization that would send out efficiency information to the dealers; it would tell them how to get the best results out of their territory, whether that territory were a city, state or county; it would teach them how to organize; it would teach them what kind of salesmen the manufacturers were finding making successes in their own organization.

This would not interfere with competition. **The cleaner and higher class the competition is the greater the demand for that product.** And that is the one point that I want to drive home to the dealers today; that is, the education of their salesmen. **If you have a large territory to cover, an important territory, don't take a salesman on your staff unless he gives you his whole time.** The automobile is too important, and you have to learn too much about it, and you have to be keyed up to too high a pitch to be able to do anything else and sell it successfully. The automobile is deserving of the whole time of a salesman.

In the choosing of the salesman I would suggest a few qualifications that are absolutely necessary to the success of your organization.

First of all, natural qualification; then the prime condition of the salesman: Personality, ambition, honesty and courage; acquired qualifications, confidence three ways, enthusiasm, earnestness, application, preparedness, observation, self-analysis.

As a business proposition it pays to be honest with one's self, with one's firm and with one's customers. In that way only will the salesman retain his own self-respect and the confidence of his customers.

There are salesmen who are known as one-trippers. They cover the district and they have told so many untruths about the product that they are selling that they are not able to go back.

Then there are those other salesmen who inspire confidence in themselves and in the product that they are selling. That kind of a salesman can go back and sell his customer a second car; he will go back and sell him a third car—because the buyer knows that the integrity and the honesty of the man that he is dealing with are back of that product which he is buying, but no honest man can sell a dishonest product.

Courage—It takes courage to be honest under all circumstances, and courage is one of the prime qualifications of the salesman; courage to go up against a man when you know that someone else has offered him a cut in commission on his product; courage to go up there with the enthusiasm based on the knowledge that your product is so much better that it is just the thing that that customer wants; so much courage that that little obstacle in your way, in the way of making the sale, is forgotten and wiped away. If it is wiped away in your own mind there will be no impression left in the mind of the man to whom you are trying to sell.

Acquired Qualifications—They are a little different from the natural qualifications. All men are not born salesmen, but every man with innate ability to get hold of true business principles, and with enough personality to meet his fellowmen, can train himself to be a salesman. After all, selling is nothing more than making the other man believe that he wants what you have got to offer; make him believe that he wants it badly enough, or, rather, well enough to get his name onto the dotted line and pay over his hard cash.

You can train salesmen, and in so doing train them first of all in honesty; then train them in courage; then train them in the essential qualification of the business, which is enthusiasm.

It matters not whether a salesman be selling an $800 car or whether he be selling a $10,000 limousine, if he is himself satisfied, if he believes that the product he is selling is the best there is to be had for the money and the most serviceable that his prospect can buy, that man can come pretty near making the other man believe that a $1,500 car is as good as a $10,000 car at the time. It is not a question of price in the selling. It is a question of sizing up the product to the amount of money you are going to ask for it.

With the dealer first of all is the product; with the salesman first of all the customer that he is going to sell and serve. There is not a man in this convention today, if he goes out in the morning imbued with the idea that he is going to sell some man or woman the best automobile that there is in Indianapolis or that there is in Detroit or in any other town, he is going out to make a clean-cut sale because he has, first of all, a belief in his product.

Earnestness—A man can be enthusiastic without being earnest. There is a manufactured enthusiasm that does not ring true in all cases. But earnest enthusiasm—not too earnest to permit a smile once in a while when you are telling all the fine qualities of your product; but that earnestness that drives home the point; that drives it home every time the salesman makes it—that is the selling qualification that they can't get away from. I don't care how strong the opposition is that you meet with, and I don't care how much another dealer is cutting and rebating. **Meet your prospect with honesty and courage and confidence in yourself and in your product, with enthusiasm, with earnestness,** and your prospects will forget the little rebate that has been offered to them.

Have patience with men whether they are in the market for your kind of a car or not; one may want a $2,700 car and another a $5,000 car. Don't get sore at those fellows that buy Fords. Ford is doing the best work for you automobile dealers today that has been done in the country. He is educating the people to buy automobiles.

The first watch that my father gave me was an Ingersoll. The Ingersoll keeps time, but I am making a little more money now and I can afford to pay more than $1.90 or $4.60 for a watch today, and the Ingersoll is in the discard. If you could see the discard corners of automobile buyers in America you could start a Ford second-hand shop; so don't knock Ford—boost him, and boost every other car that comes into competition with your own product. **A boost gets more than a knock anywhere, and a knocker only belongs on the outside of the door and not on the inside of a prospect's home.**

Don't think for a minute that all that the salesman must know is just enough to be able to go out and discuss just one thing, just the automobile. **The more interesting a salesman can make himself in his community the more re-**

spect he can command from the people with whom he expects to do business—the easier it is for him to get next to them.

It is important that the salesman be a broad-minded business man, an efficient business man, with a knowledge of the laws of supply and demand; with a knowledge of credits; with a knowledge of advertising; with a knowledge of money; with a knowledge of investment. He should be a man with all men. He should be able to talk banking with a banker. He should be able to talk manufacturing with a manufacturer; and he should be able to talk those subjects intelligently. That is efficiency. And when a man gets hold of business principles and grasps them tight he will soon find out that when he meets men he is gaining their respect. He has added to personality an irresistible force of a broad education along tangible business lines, and that commands respect.

When you have told the story of your car have you said all, or are you ready to go on talking about your prospect's business? Are you able to interest him, if he has not bought that car, to such an extent that when the next man comes around to try to sell him he will remember you, and he knows that you are coming back?

The last point—that is specialization. Take a prospect and go after it. Don't go after ten men at the same time. While you are going after ten men there is some salesman tacking close after each one of them, and while you are only giving each man who is a prospect one-tenth of your selling qualifications and power, there is some one else there who may not be as good a salesman as yourself, that is, if you systematized your work, who is getting the order from him.

Don't let salesmen run riot over your territory. Take your Bradstreet, your Dun and your directory and inform yourself until you have the names of all the persons in your territory carded up, and when your salesmen come in in the morning, say to John Jones, "Here are six names. I want you to see those parties today. They are on the east side of town." And when Tom Smith comes in, say to Tom Smith, "Here are six names over in another district. They have seen our advertisement. They have inquired about our car. They are interested. Go out and see them and don't see another man in that county."

Systematize and hustle along the right lines, and if you hustle along the right lines you will see your efficiency is growing, and you will see that the manufacturers will soon be coming after you for pointers. That is the game. Systematize the work of your salesmen. Don't send salesmen out who you don't think are qualified in every respect to represent you.

Don't knock the product of any other manufacturer. Boost them all.

The automobile industry has come to stay. There have been more good things killed by knocking than by any other one means. When you begin to suggest a negative idea to a buyer, by telling him that the Cadillac is not good, or the Chalmers is not good, you are putting that prospect into the frame of mind where he says, "My God, is there a good car?"

Boost, but boost your own product the best.

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Taxis Form an Export Element

NEW ORLEANS, OCT. 18.—Taxicabs form a large percentage of the motor cars exported to Latin America through this port. With the increasing amount of smooth-surfaced streets in that section of the world, taxicabs are taking the place of the time-honored coach. In all Latin American cities the public coach service is an institution that was inaugurated shortly after the coming of the Spaniards and has flourished despite the advent of street-cars and automobiles.

Coach fares are very cheap, being regulated by the municipal governments. The best coaches, really elegant equipages, are hired for 50 cents per hour, but the medium class, which is more generally used, can be had for 37 cents an hour. This low rate has made it necessary to quote almost as low rates for taxicabs and as there is little variation in the coach rates throughout Latin America, it will be found that taxicabs usually may be had at a slightly higher rate than is charged for the first-class coaches. The low rates and the time saved have made this class of motor car very popular and most Latin American cities, where the streets are improved, has doubled or tripled the number of taxicabs found in American cities of the same size.

Freight Cars Are Scarce

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Present Shortage of 31,000 Will Probably Increase to 60,000 at the Crest of the Crop Movement, Says J. S. Marvin of N.A.A.M.

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WITH a net shortage of freight cars reaching beyond 31,000 reported by the railway associations for the fortnightly period just past and in view of the probability of a still greater shortage during the next month, the automobile industry is interested to know whether conditions are going to improve before the height of the shipping season of the industry.

James S. Marvin, traffic manager of the National Association of Automobile Manufacturers, has returned from a trip through the manufacturing centers and states that shipments are moving, but that in the event of a general stringency of the freight car situation the automobile industry would have to take its chances with other shippers.

Mr. Marvin said: "Since May 1 I should say that the railroads have added about 5,000 wide-door freight cars to their equipment and that the total number of automobile cars on the American railroads on January 1, 1913, will approximate 50,000.

"Conditions this fall have no parallel in the history of the world. The demands for cars to move the unprecedented crops and the general demands of business are sharper than ever before known. The busiest part of the automobile shipping season is still some distance in the future and if the weather remains good there is a prospect that the traffic demands may be satisfied. The movement of the crops has not reached its crest, but the agricultural wealth of the country is moving in tremendous volume right now.

"The railroads are doing everything in their power to prevent congestion, to give them due credit. They are quite as anxious as the shippers possibly can be to keep their cars moving under profitable loads and have adopted special rules for quickening terminal work.

"Reports have reached us that automobile freight cars are being used for other kinds of traffic. I will say that in the case of an eastern road, for instance, where there are thousands of automobile cars in the equipment, it is exceedingly difficult to regain possession of cars that have been consigned with freight to some section where the demand for rolling stock is feverish. The existing plan of interchange in the use of cars is far from the ideal and the solution of the problem is still to be met.

"The elaborate car service departments installed by all the railroads have frequent records of cars absent from the service of their owners for months at a time. It is hardly to be expected under present conditions that a western road would go out of its way to return cars of an eastern colleague at a time when the demand for cars in the territory of the western road was far in excess of the possibility of supply."

It is considered quite likely that the total net shortage of cars at the crest of the crop movement will approximate 60,000. After passing the crisis the volume of shipping has usually decreased slowly but steadily for a month and then rapidly for another month. At that rate the car situation should be cleared by February 1, when the season for shipping automobiles is at high tide. If the country enjoys good weather in December the traffic men look for a natural development of the situation, but an early blizzard at a time when the shipments are still extraordinarily heavy might serve to produce a congestion the like of which has never been known.

Possibly with such a contingency in view the great producers of automobiles have made an early start with their shipments. The annual report of General Motors shows that its receipts for the first two months of the fiscal year were $1,000,000 in excess of last year. The Overland company has adopted methods to accelerate deliveries of sold cars and Ford shipments have made an entirely new mark as to volume for this time of the year. In addition to these precautionary measures, indicated by the increased volume of early shipment, every large producer has endeavored to provide for a supply of cars to transport its output. The railroads have assumed a hopeful atitude as to general results and promises and agreements have been made by them to avoid a repetition of last spring's congestion.

Getaway of the George H. Robertson Trophy, 25-mile free-for-all, at Brighton Beach, which was won by Neil Whalen in a National

Brighton Races Success

Eight Interesting Events Run Off—Wishart, Lewis and Whalen All Star—Over 4,000 Spectators

DESPITE lowering clouds which kept down the attendance, the race meeting staged at Brighton Beach Saturday was the best presented to metropolitan lovers of speed in many a long day. There was a sharp brush in each event run off and the suspicious circumstances of some former meets were delightfully absent. The promoters probably lost a little money because of the clouds, but the impression made on the public was distinctly favorable to future meetings.

The card was divided into eight events and two exhibitions and the running was done in precise accordance with the schedule and rules. The first event started sharply at 2:30 o'clock and the interminable delays of other days was absent.

The feature race of the day was the George H. Robertson Trophy event at 25 miles, free-for-all which was handily won by the National driven by Neil Whalen. At the start the Buick Bug made the pace, closely accompanied by Wishart's Mercer Special. The hot gait they pursued resulted in the retirement of both before the midway station had been passed. The National had been laid off the pace in the early stages and when the Bug went out with a blown tire and Wishart's mount faltered, Whalen came along with the blue car and tin-canned to the wire. The National was chased determinedly in the last 5 miles by Ferguson's Mercer and the speedy Stutz came booming at the end, but the National had been aided in establishing a wide gap by reason of the sprint of Wishart's Mercer which had lost a lap earlier in the race. Wishart tried to pass the winner and in the duel that followed the other cars were lost.

A full score of cars participated in the various events and a national tinge was imparted to the card by the appearance of such names as Mortimer Roberts, William Chandler, David Lewis, Ray Howard, Neil Whalen, Spencer Wishart, Ralph Mulford, Caleb S. Bragg and others in the list of

The handicaps were well filled, a dozen starting in the 5-mile event and eight in the 10-mile contest and the class events drew good fields. The allotment of handicaps proved to be a good job as the finish in each of the condition races was uncertain until the final lap.

The opening sprint was for cars having a total piston displacement of less than 230 cubic inches and drew a field of six, from which the R. C. H. entry was scratched. This event did not develop much of a struggle, but was interesting from the fact that the winner was a Mason Special, which was making its metropolitan début. The distance was 5 miles and the Mason, under the handling of M. Roberts, jumped into the lead after one false start and set a winning pace to the wire. The E-M-F was a handy second and the Hupmobile, running very steadily, was third.

The second event was for cars of 231-300 cubic inches piston displacement and had five entries originally. To these was added at the post the Mercer Special, handled by Wishart. It was known that the car exceeded the class limit by a small amount of piston space, but this fact was overlooked in the rush before post time. The Special got away smartly and cut out a rapid pace, accompanied by Ferguson's Mercer. A bigger Mason driven by Roberts made a bid in the early part of the race, but carbureter trouble soon made its appearance and the car retired to the background. The Bergdoll kept up with the procession throughout and in the final mile passed all but the Mercer pair. The finish showed Wishart's car in front with Ferguson's second and the Bergdoll third. Protest was immediately lodged with Referee Pardington and Wishart admitted that his car was outside the class. The official disqualified the Wishart Mercer and placed Ferguson's mount first and the Bergdoll second.

The third race was at 10 miles for the Poertner Trophy for cars of 301-450 cubic inches piston displacement. It brought out only four starters, Stutz, G. J. G., Pope Hummer and National. The National started well but retired after making 1 mile because of a blown tire in front of the grandstand. This left the Stutz out in front, where it stayed to the end. The Pope kept going until it had made 9 miles, but was unequal to the task of standing off the rush of the G. J. G. The Pope was not in good condition, but the G. J. G. ran a creditable race. The Stutz had the speed of the party and as subsequent events proved might have beaten the National even if there had been no tire trouble.

The Borax Trophy at 5 miles came next with a field of four: a Mason, Mercer, Buick and National. The National again suffered a blow out, but managed to finish. The Buick retired after tire trouble at the head of the stretch, where its disablement almost caused a disaster to following cars. The Mercer, driven by Wishart, had a nice trip landing in front, the length of the stretch ahead of the Mason, which was handled by Mulford.

The Whiting Trophy, an invitation race for Mercer cars at 5 miles brought out a field of four and Ferguson's mount took first from Wishart's car, while Mitchell was third and Wolf fourth.

The 5-mile handicap developed a fine race. The Buick Bug

was given the position of honor on scratch because of its past history. The Stutz and National started 10 seconds ahead; Ferguson's Mercer, 20 seconds, which was the same rating given the Bergdoll. The remainder of the field was given various handicaps, the limit man being the Flanders (Wood), who had 75 seconds.

The Bug failed to catch the field and was not prominent at any period of the race. It was a duel between the Stutz and the National until the last mile, when the latter lost some of its speed and allowed the Bergdoll to nose it out for second money. The Stutz made fast time and finished the race in 4:27.50, or 67.29 miles an hour.

The last race of the day was the 10-mile handicap, with the penalizations rearranged to correspond with the performances in the preceding race. This placed the Stutz on scratch with the National and Wishart Mercer at 25 seconds, the Ferguson Mercer at 45 seconds and the rest spread out to the limit, which was given the E-M-F, 75 seconds. Wishart's car made the pace, picking up the cars that started in front of it after the third mile. The Stutz carried too much of a burden and while it keept shooting at the Mercer, it was never able to cut down the handicap so as to bring Wishart to a drive. The finish found the Mercer Special in front with the Ferguson Mercer second and the Stutz third 3 furlongs back.

A. R. Pardington acted as referee, Fred J. Wagner starter and the promoting organization is known as the Motor Dealers' Exhibit Company. The money prizes aggregated $1,450 and five handsome bits of plate went to the winners of the important races. The summary follows:

Class C, 5 miles, under 230 cu. in.

Car	Driver	Time	Car	Driver
Mason	M. Roberts	5:18.55	Herreshoff	S. Casey
E-M-F	W. Chandler		Flanders	F. Wood
Hupmobile	E. Meyer			

Class C, 10 miles, 231-300 cu. in.

Mercer	A. Ferguson	9:33.15	Mercer	P. Thebaud
Bergdoll	E. Homan		Mason	M. Roberts
Correja	J. Quinlan		Mercer	S. Wishart

Mercer (Wishart) finished first but was disqualified as out of class.

Class C, 10 miles, 301-450 cu. in.

Stutz	D. Lewis	9:32.50	Pope Hummer	R. Howard
G. J. G.	P. Thebaud		National	N. Whalen

Class E, 5 miles, under 600 cu. in.

Mercer	S. Wishart	4:46.25	National	N. Whalen
Mason	R. Mulford		Buick	R. Howard

Class D, 25 miles, free-for-all

National	N. Whalen	24:54.85	Mercer	S. Wishart
Mercer	A. Ferguson		Mason	M. Roberts
Stutz	D. Lewis		Buick	R. Howard
Mercer	C. Wolf		Hupmobile	E. Meyer

Class E, 5 miles, Invitation

Mercer	A. Ferguson	4:56.85	Mercer	L. Mitchell
Mercer	S. Wishart		Mercer	C. Wolf

Class E, Handicap, 5 miles

Stutz	(10)	D. Lewis	4:27.50	Mason	(30) M. Roberts
Bergdoll	(20)	E. Homan		Correja	(50) J. Quinlan
National	(10)	N. Whalen		Hupmobile	(60) E. Meyer
E-M-F	(35)	W. Chandler		Flanders	(75) F. Wood
Mercer	(15)	A. Ferguson		Buick	(scr.) R. Howard
G. J. G.	(25)	P. Thebaud			
Mercer	(25)	C. Wolf			

Class E, Handicap, 10 miles

Mercer	(25)	S. Wishart	9:30.15	E-M-F	(75) W. Chandler
Mercer	(45)	A. Ferguson		Mason	(65) M. Roberts
Stutz	(scratch)	D. Lewis		Mercer	(55) P. Thebaud
Mercer	(55)	L. Mitchell		National	(25) N. Whalen

English High-Gear Tests

Royal Automobile Club Tries Out Pathfinder on 1,934.75-Mile Run with High Gear Continually in Mesh

LONDON, Oct. 17—Under the observation of the Royal Automobile Club, a 27-horsepower Pathfinder car weighing 2,975 pounds was driven over a course of 1,934.75 miles with the high gear in mesh at all times. The car traveled from Land's End to John O'Groats and back; the course includes a number of hills, all of which were taken, though sometimes with difficulty, as in the case of Berridale Hill, which the car mounted, but at the seventh attempt to do so. Another factor which made travel difficult at times was inclement weather. The automobile is of the standard Pathfinder make, its engine having been measured by the R. A. C. officials as 105 by 133 millimeters, and the machine has traveled some 7,000 miles before the test. After the trip was over the car was taken to Brooklands track for some speed demonstration work, and attained a speed of 55.92 miles an hour. This latter performance was conducted independently of the high-gear test and no credit was given for it in the official R. A. C. certificate, which covers only the factors entering into the original tests.

A similar test was made about 3 weeks ago on a 59.9-horsepower, six-cylinder Napier car, having cylinders of 127 millimeter bore and 127 millimeter stroke and weighing 5,472 pounds. The high-gear ratio, which was used throughout the trip, is 2.7 to 1 and the full wind area 10.3 square feet; the tires used on the car were 35 by 6 inches. Over a course of 795.875 miles, from London to Edinburgh and back, the car was driven in high, excepting for a short distance, where the driver had to drop in low gear due to the presence of troops in the road. The car was also put to a test on Brooklands track and went at the rate of 75.69 miles an hour. During the London-Edinburgh-London trip the car consumed 23.1 gallons of gasoline, being 29.1 gallons per mile.

Rain Spoiled Sport at Rockingham Park

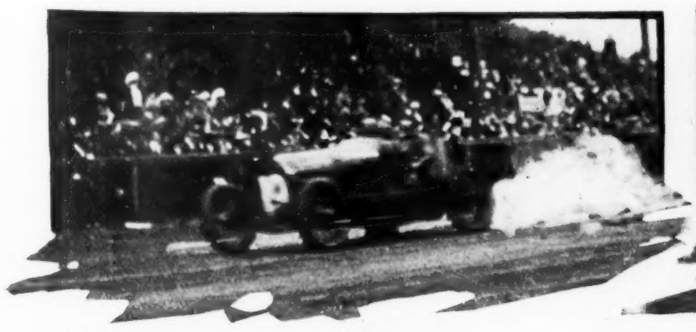
BOSTON, MASS., Oct. 19—Rain put an end to the automobile race at Rockingham Park, Salem, N. H., today, after seven of the ten events had been run. There were more than 5,000 people at the track. When the rain set in the race was called off permanently, having been postponed once before. Iselin and Higgins were the heroes of the day. The summary of the races follows:

5-Mile, Non-Stock, Under 300 Cu. In.

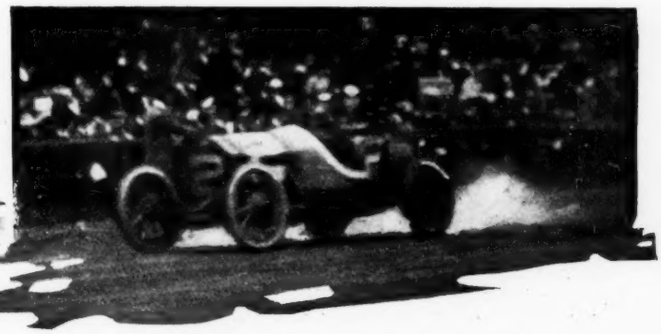
Car	Driver	Time
Mercer	C. O. Iselin, Jr.	5:50
Mercer	H. Cutting	
Buick	S. S. Bigelow	
Hudson	C. Smith	

10-Mile, Non-Stock, Under 300 Cu. In.

Car	Driver	Time
Studebaker	D. Higgins	13:15
Penn	J. Pugh	
Hudson	H. Warren	
Mercedes	A. D. Young	



Spencer Wishart, who won two of the Brighton races in a Mercer



David Lewis, who won two events in a Stutz

Six Cars Still Perfect In Lake Michigan Run

Heavy Rain Converts Dirt Roads Into Morasses and Causes Withdrawal of Four and Points on Five

ESCANABA, MICH., Oct. 22—**Special Telegram**—Rain falling yesterday and today put a period to the hopes of four of the contestants in the Chicago Motor Club reliability run around Lake Michigan and only 2 days of the schedule have been run off. It turned some of the dirt roads into swamps and made the going on the improved roads uncertain and difficult. The 18 and 20-mile an hour schedule in force today was too much for all but six of the contesting cars. In addition to the three cars that withdrew, another has not been reported at a late hour tonight and five were penalized for work or lateness. The perfect score division in the touring class includes: Case 2; Staver 4; Abbott 6 and R. C. H. 7. In the roadster division the only clean scores are carried by the Moline pair.

Only One Penalization At Oshkosh

OSHKOSH, WIS., Oct. 21—**Special Telegram**—Fourteen cars finished the first day's run in the sixth annual reliability contest of the Chicago Motor Club with perfect scores. Only one of the fifteen contestants which lined up at the start of this strenuous run around Lake Michigan fell by the wayside. When the cars had checked in here tonight after their first leg of 171 miles from Chicago the only car missing was National No. 8, entered by Chicago Spring Wheel Motor Company, equipped with spring wheels made by the entrant. This car had trouble with its rear axle in the morning and failed to check in at the noon control at Milwaukee. A wire received here says that the National is on the way and will be in Oshkosh before the morning start.

R. C. H. entry No. 7 broke its rear axle just before lining up at the start this morning. The press car, also an R. C. H., was started as No. 7 and probably will continue in the contest in that capacity. Another R. C. H. was started out from Chicago to carry the press men about 3 hours after the rest and by spectacular driving caught the tour here only a few hours late.

The threatened arrest of N. H. Van Sicklen, Sr., one of the judges in the pilot car, was the only incident of the day. The Oshkosh chief of police considered it his duty to arrest the pilots for throwing confetti on city streets, but was talked out of it.

Starting this morning under a cloudless sky, the tourists found good roads all the way to Milwaukee. From there on the quality of the road varied from best to bad. Most of it was fine gravel, and near Fond Du Lac a stretch of about 4 miles of cement was found which enabled the tourists to make up lost time. A driving rain was the only uncomfortable feature of the afternoon, but it lasted only an hour. It was sufficient to make mud roads for the rest of the way to Oshkosh. Tomorrow's run takes the tourists of Escanaba, in northern Michigan, a distance of 177 miles from Oshkosh. Noon control is to be at Oconto, 89 miles away. The road tomorrow includes some dirt which, with today's rains, probably will be mud. With the exception of a few miles the road is expected to average fairly good through Neenah and Green Bay to Oconto. Thence to Marinette. From there to Escanaba there is a stretch of fine macadam, 63 miles in length, built under bounty from the state.

ESCANABA, M.CH., Oct. 22—**Special Telegram**—Six out of fifteen cars in the Around-Lake-Michigan tour completed the second day's run to Escanaba tonight with clean scores. Five received penalties today, one had not checked in at 10.30 o'clock and three have withdrawn from contest. Gray's National Number 8 withdrew at Racine, Velie, number 101, withdrew at Oshkosh this morning, and the R. C. H., 110, went out this afternoon with a frozen motor. Practically all trouble to cars receiving penalties was due to the rain which continued almost without cessation from noon yesterday till this afternoon. Roads which would have been good in dry weather were made so sloppy that mud and water splashed in magnetos and carbureters. There were two hills with mud so deep and so thick that cars stalled and had to be helped up.

About 50 miles of state-built macadam between Marinette and Escanaba and upon the stretch and west boulevard the cars could make 50 miles an hour. Much time lost in negotiating bad stretches was made upon these roads. Velie number 1 received two demerits for cleaning its carbureter which was stopped up with mud. Staver, No. 3, eight points for same; Bergdoll, No. 5, broke its steering knuckle near Green Bay but Monson, the driver, put in a new one and got into night control less than 3 hours late, sustaining 161 points penalties. Bergdoll, number 104, was stuck for 30 minutes in mudhole but pulled itself out with a winch driven by the motor, receiving 30 points for lateness. Stutz No. 109 came into Escanaba several hours late on account of battery trouble and its fenders bent by broken tire chain, sustaining 182 points. Stutz No. 102 has not checked in and is over 6 hours late. Branstetter's Kissel, acting as pilot had carbureter trouble at noon and the Case threw confetti for rest of day. The Staver pacemaker also had carbureter trouble from rain and mud and referee Root nominated the Velie as pacemaker for the day. The R. C. H. press car chugged through in good order but had a narrow escape from upset when it skidded to the edge of a 12-foot ditch. Skillful driving kept it from going over the edge.

The Midland, carrying starter Watts, was held up at Green Bay and both Watts and the driver Kavanaugh, were arrested for scaring a horse and wrecking a buggy. They were not detained long. Five cars finishing with perfect scores are: Koease, Staver No. 4; Abbott, R. C. H., No. 7 and the two Moline cars driven by Wicke and Salisbury.

Today's run of 177 miles from Oshkosh to Escanaba was covered at regular running schedule of 20 and 18 miles per hour. It took hard driving to maintain this schedule through the mud. Noon control was Oconto.

Hardest Run Is Wednesday's Schedule

Tomorrow's run from here to Newberry is expected to be the hardest of trip on account of the naturally poor road conditions and excessive rain, although the distance is only 125 miles with the running schedule reduced to 13 and 11 miles per hour, with noon control at Mantique.

The rules of the contest provide for penalities on account of work on the road and lateness at either of the daily controls. The points are reckoned on a basis of one for each minute spent in repairs or making adjustments for each man so engaged and also for lateness at controls a demerit is charged for each minute after the regular checking time of the car that intervenes before the car checks in. A leeway of 3 minutes is allowed at all controls. Larger penalizations are likewise levied for certain kinds of repair work.

SUMMARY OF 2 DAYS OF CHICAGO MOTOR CLUB RELIABILITY

No.	Car	Driver	Penalties 1st day	Penalties 2d day
1	Velie	John Brolley	0	2
2	Case	J. Hanson	0	0
3	Staver	E. Knudson	0	8
4	Staver	G. Monkmier	0	0
5	Bergdoll	A. Monson	0	161
6	Abbott	A. M. Robbins	0	0
7	R. C. H.	B. Parke	0	0
8	National	R. B. Gray	Not reported withdrawn	
		ROADSTER DIVISION		
101	Velie	M. H. Luce	0	Withdrew
102	Stutz	R. E. Maypole	0	Not in
104	Bergdoll	T. Rooney	0	30
105	Moline	J. A. Wicke	0	0
106	Moline	F. G. Salisbury	0	0
109	Stutz	C. Anderson	0	182
110	R. C. H.	M. Barney	0	Withdrew

Ford Wins Iowa Run Driven By Its Owner

Final Scores Not Announced, But Paige, Chalmers and Warren Are Placed First In the Various Classes

DES MOINES, IA., Oct. 21—The fourth annual Little Glidden tour of the Iowa Automobile Association which closed Saturday night after an 850-mile circuit over Iowa, was won by a Ford roadster, owned and driven by Dr. R. W. Soper, of Luther, Ia. The Ford won, in addition to the sweepstakes cup, the first prize for cars selling at $800 and less. The other prize winners and their classes were as follows: $800 to $1,200 cars, Paige; $1,200 to $1,600, Chalmers; $1,600, Warren.

No scores were announced by the referee but it is shown that the Ford came through with an almost perfect score. The only penalty imposed was caused by faulty gasoline which caused Dr. Soper to stop his motor. Penalties inflicted by Referee C. A. Knedler, of the American Automobile Association, were for time on magneto, time on steering gear, time on gasoline tanks and time on tires.

The Paige, winner in its class, was the same car and driver which recently finished well in the Buffalo run. The Chalmers winner was a 1909 veteran, driven by August Gronau, of Des Moines.

Postponements and fear of the weather so late in the season kept down the number of entries materially but outside of this feature the run was by far the most satisfactory ever pulled off in Iowa. Never before have Iowa towns along the route of an endurance run gone to such arrangements to provide entertainment and comfort for the contestants. All the towns and many of the farm houses along the route were decorated and the roads had all been dragged so that for the most part they were as level as a floor.

The White Pole Association, which is the good roads association back of the route from Des Moines to Council Bluffs by way of De Soto, gave the tourists probably the warmest reception of any received. The White Pole enthusiasts had provided a loving cup as one of the prizes and for this reason took unusual interest in the run. Many of the automobile owners along this road met the contestants at De Soto and went through all the way to Council Bluffs, which was the first night control. The second day out, the run traveled from Council Bluffs to Sioux City, following the west bank of the Missouri River. The third day brought the tourists into Ft. Dodge for the night control. Waterloo was the noon control on the fourth day; the motorists there met the tourists and a 2-hour stop was made while Waterloo and Waverly enthusiasts gave the visitors a banquet. Cedar Rapids was reached in plenty of time for the night control.

The final day gave the contestants a 200-mile drive into Des Moines by way of Oskaloosa, and the east branch of the White Pole road. The last car had checked in at 5.10.

The object of the Iowa reliability run is largely to create interest in good roads and the run this year certainly had proof of the fact that the Hawkeye state is a leader in the good roads movement. Almost every town along the 850-mile route has some sort of a good roads organization and many of these associations had provided some kind of a showing for the benefit of the contesting cars.

Blue Book Tourist Back at Denver

DENVER, COLO., Oct. 19—Trail-blazers who set out to secure data on the Denver-Salt Lake route in particular and Colorado roads in general, returned to Denver this evening after having covered 1,300 miles in a White six-cylinder car furnished by the White company, of Cleveland, for this particular expedition, which was carried out under the direction of the Official Automobile Blue Book. In the party were John P. Dods, of the Blue Book; Nathan Lazarnick, the New York photographer; James A. Harris, advertising manager of the White company, and D. Walter Rheineck, also a White man.

The party left here October 7 with the intention of laying out an official route to Salt Lake City, but after reaching Grand Junction, Colo., plans were changed and the return to Denver was made over the Rainbow route to Pueblo. The change in plans was brought about by the discovery that the Utah people have not completed their road work. They evidently have failed to realize the importance of improving the trail, so after a short trip into Utah out of Grand Junction, Dods and his party decided not to go to Salt Lake, delaying the routing of this stretch for another month, when it is the intention to send out another Blue Book car and secure all the necessary data to make the route complete.

On the outgoing journey the White six poked its nose along a trail that led through Buena Vista, Leadville, Wolcott, and Glenwood Springs to Grand Junction, a distance of 365 miles. Then, upon finding that Utah was not ready, the return trip was started, going through Gunnison, Salida, Canyon City to Pueblo, from which point the party went north to Denver, the distance on the return leg being 300 miles. In addition to the main expedition Dods covered several other stretches that connected with the main line, collecting road data.

"We took 450 photographs on the trip," said pathfinder Dods upon the completion of the trip. "When we reached Grand Junction we went out into Utah a few miles to find that no work had been done in the desert and that heavy rains had made the roads bad. On consultation with the Grand Junction people we decided to defer the rest of the routing for a month.

"On our way back to Denver we saw some wonderful sights. We saw the Black canyon of the Gunnison from the cliff road, 2,000 feet up. The new road over the black mesa was not completed and we had to use the old road, which has dangerous, sharp turns on a 28 per cent. up grade. It took us 4 hours to get up 5 miles, a rise of from 1,600 feet to an altitude of 10,500 feet. It's a wonderful country."

Stutz Wins Feature at Narberth

PHILADELPHIA, PA., Oct. 19—As an additional feature to the getaway day attractions of the Inter-County Fair, which has been in progress throughout the past week at the Belmont race track, Narberth, a series of automobile races was conducted this afternoon with several well-known local motorists as the contestants.

In a 50-mile free-for-all race the Stutz car, S. R. Blockson driving, romped away with the honors from a field of six cars, the event being declared finished at the conclusion of 48 miles owing to the withdrawal of all the other contestants but one, which car was too far behind at the time to figure. Time for the 48 miles, 45 minutes. The track was in excellent condition and the attendance was large. The time made in the feature race was considered remarkably fast.

Richmond Show to Be in Horse Arena

RICHMOND, VA., Oct. 21—The Horse Show building has been secured by the Richmond Automobile Dealers' Association for their first automobile show, which will be held February 16-23. The sum of $10,000 will be expended in putting on the exhibition, which promises to be one of the greatest events of the kind ever held in the South. There is a total floor space of 13,000 square feet and up to date there remains but about 2,000 square feet to be allotted, with quite a number of local dealers and accessories firms to hear from.

Thomas B. Hutchinson, of Nw York, is general manager of the association.

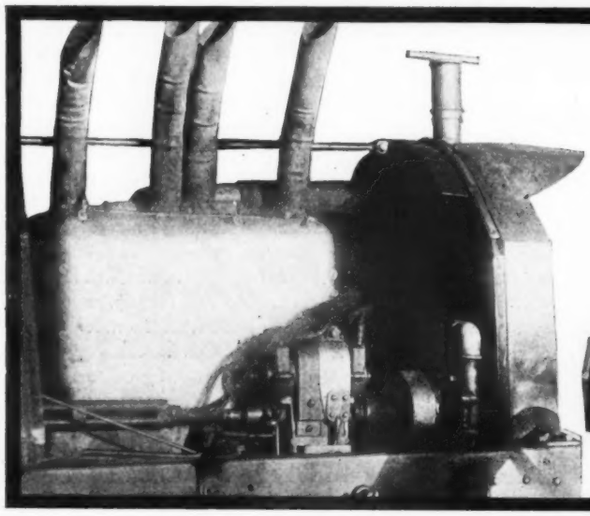


Fig. 1—Right side of Duesenberg-Mason motor showing external exhaust pipes and large cover plate which conceals valve mechanism, as shown in Fig. 5

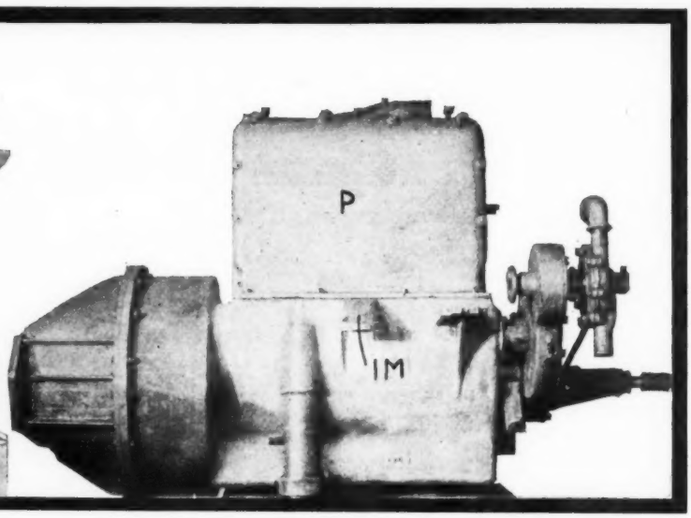


Fig. 2—Right side of Duesenberg-Mason motor, with valve cover plate P, intake manifold M, and showing unit combination of motor and gearbox

Mason Racer Analyzed

Winning Car in Two Milwaukee Races Photographed Immediately After Contests—Details of Motor and Chassis

Lubrication of Motor and Carbureter Details of Special Interest—Novel Valve Operation Used

NOW that the 1912 racing season has come to a close, it is time to compare notes. The American cars which have competed in the big events of the year have acquitted themselves most creditably. They have all shown themselves to be mechanisms of stamina of which we may well be proud.

In the small car races which have been held in conjunction with all the big racing meets this year, the Mason machines have excited much interest for their consistent performances. Early they began to get a name for themselves at the Algonquin hill-climb, in which they were the runners-up, winning in their classes; later at Galveston and Elgin they carried off the small-car honors, which their most recent achievements have been the winning of the Pabst and the Wisconsin Motor trophies races, held in connection with the Milwaukee program.

"What is there to these cars which causes them to perform so well?" was asked.

There are several things which help to make a good car, and one of these is undoubtedly the motor. The Mason Special motor is of peculiar construction and is exclusively the design of F. S. Duesenberg and his brother. The engine involves a number of principles upon which patents have been applied for. The most important are those which relate to the valve and rocker arm construction and to the method of oiling these.

The car in which Mortimer Roberts won the Pabst race is illustrated herewith. Perhaps the keynote of the success of this car, and the others of the Mason team this year, was struck by Mr. Duesenberg when he stated that "the machines are not built for extreme speed, but rather for durability under extreme conditions."

The motor is suspended from the frame at three points, the front support providing a swivel, allowing the engine to adjust itself to unequal road conditions, without strain.

The cylinder casting is a monobloc type, and the crankcase is made in one piece. The crankshaft is easily reached through the large opening, Fig. 10, and has two bearings, whereas the camshaft has three.

An idea of the overall dimensions of the motor may be gained from the monobloc cylinder casting dimensions. The length of this casting is 18.5 inches; the height 14 inches; and the width 6 inches; it being faced on top, both sides and bottom, the latter where it rests on the crankcase, and the other three facings to receive the water-jacket plates.

Looking at the two right side views, Figs. 1 and 2, of the motor as it appears in Roberts' car, the gases exhaust through the top of the hood, the four vertical pipes conducting them outside. Such a means of getting rid of the exhaust makes for least resistance to the outward flow. In Fig. 2 the extreme simplicity of construction is brought about through the use of the cover plate P completely inclosing the valve mechanism, and excluding all foreign matter and making possible the peculiar oiling of the valves and their parts, which is to be a patented feature.

Figs. 6 and 7, of the left side of the Duesenberg motor, show the two sets of spark-plugs arranged horizontally. The large diameter water connections are also illustrated.

The waterjackets deserve mention, as the cylinder casting is found open on both sides, and on the top. The left side open space is covered by the aluminum plate of which the inlet water connection WC, Fig. 7, is a part. The plate WP on the right

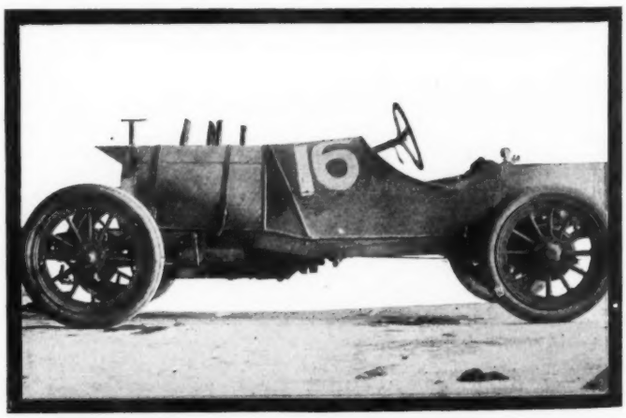


Fig. 3—Mason Special racer which won the Pabst Milwaukee trophy, showing vertical exhaust pipes in top of hood

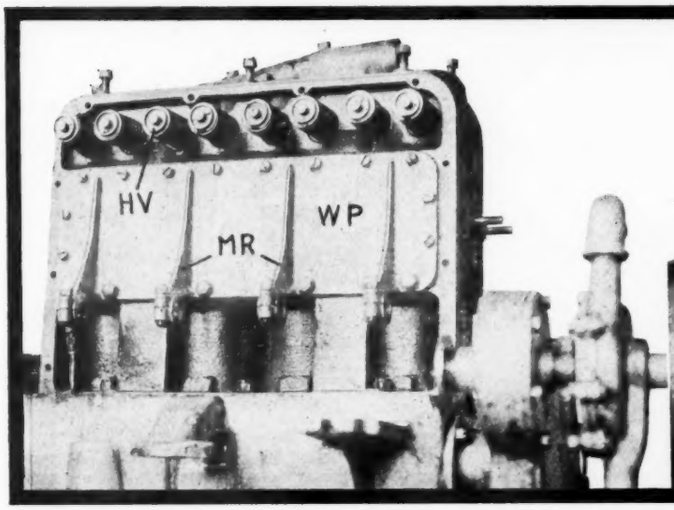


Fig. 4—Right side of Duesenberg-Mason motor, with cover plate P, Fig. 2, removed, and showing plate WP forming the side of the water-jacket, and having bearings MR for the shaft carrying the valve rockers shown in Fig. 5

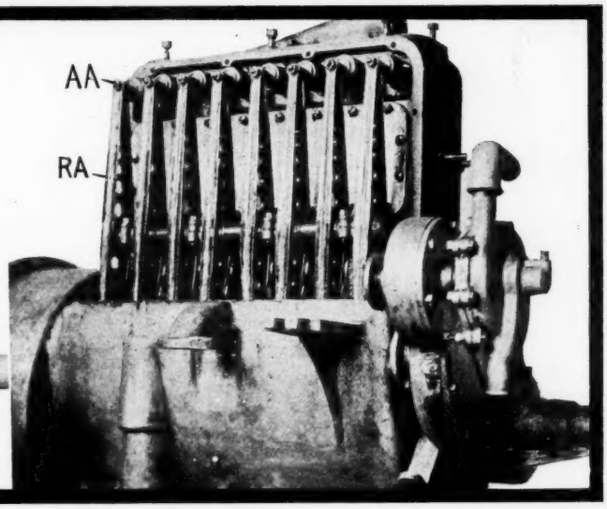


Fig. 5—Right side of motor, showing long valve rockers RA, the lower ends of which bear on the cams and the upper ends on the valve stems. Adjustments AA in the upper ends make provisions for wear and necessary valve timing

side, Fig. 4, carries the four supports MR for the rocker arm shaft. The top jacket opening is covered by the plate which also forms the water outlet manifold to the radiator.

The motor has a bore of 3.875 inches, and the long stroke of 5 inches, giving a bore-stroke ratio of 1:1.29. The valves are placed horizontally, opening directly into the explosion chambers, thereby eliminating valve pockets. The inlets have a diameter of 1.875 inches, and the exhausts are .0625 inch less. The lift of both is .34375 inch. In placing the valves horizontally over the cylinder heads, the designer's idea was not only to reduce the wall area of the combustion chamber, but to put the exhaust openings in such a position that the burnt gases would have a very much freer exit than could be obtained by any other arrangement.

On the opposite side from the valves, plugs are placed, Fig. 6, in the centers of which the spark-plugs are located. These plugs or valve caps make it possible to inspect the cylinder heads and the piston faces and to remove carbon therefrom.

The valves are of the conventional poppet variety with a 30-degree bevel. The stems are 5 inches in length and .4375 inch in diameter. The stems are of carbon steel electrically welded to the 3.5 per cent. nickel steel heads. The ordinary type of coil spring serves to close them, but opening is accomplished through the use of long rocker arms, Fig. 4. The lower ends of these rockers rest against the cams, which are an integral part of the camshaft, and the upper ends are in contact with the ends of the valve stems. These ends are provided with adjustments which allow for taking up of wear, and for fixing the clearance between stems and arms.

The contact points of the rocker arms are hardened. These arms have a length of 14 inches. The distance from the point of cam contact to the center of the arm pivot is 6 inches, while from the rocker shaft to the valves is 8 inches. This greater length above the rocker shaft gives quicker cam than valve action, making for quiet cams.

The peculiar piston construction is illustrated in Figs. 8 and 10. There are three piston rings which are placed in each groove. One is twice as wide as the other two, and is placed inside the two narrower ones. The ring joints are beveled. The pistons have a length of 4 1-2 inches, only 3 1-4 inches of which length is in contact with the cylinder walls, the center being a broad shallow groove, done to decrease the wear, and to aid in oil distribution. The pistons are of gray cast iron; the cylinders of cast iron; the connecting-rods of carbon steel.

Another peculiarity is the method of conveying the explosive mixture to the intake valves. Looking at the views which show the valve side of the motor, Figs. 8 and 9, the inlet N is integral with the crankcase, and the inlet passages are cast as a

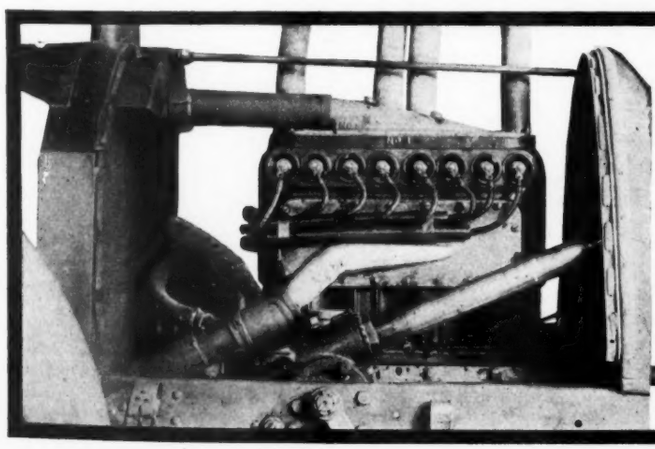


Fig. 6—Left side of Duesenberg-Mason motor, showing spark plugs mounted horizontally in plugs in the sides of the combustion chambers. The large water connection pipes appear

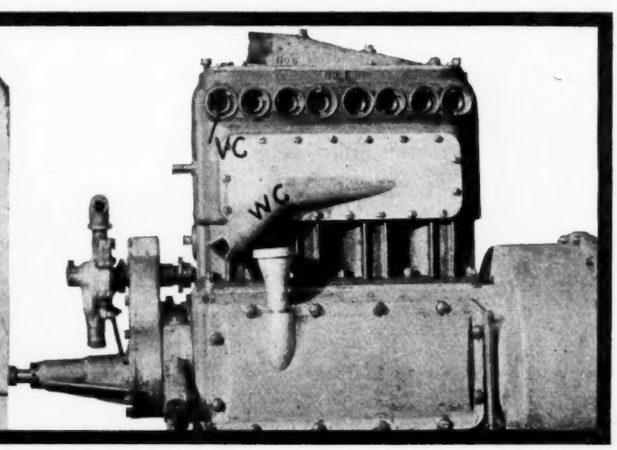


Fig. 7—Left side of motor removed from chassis of Robertson's car after the Pabst race. The large crankcase inspection plate is shown with its oil filler

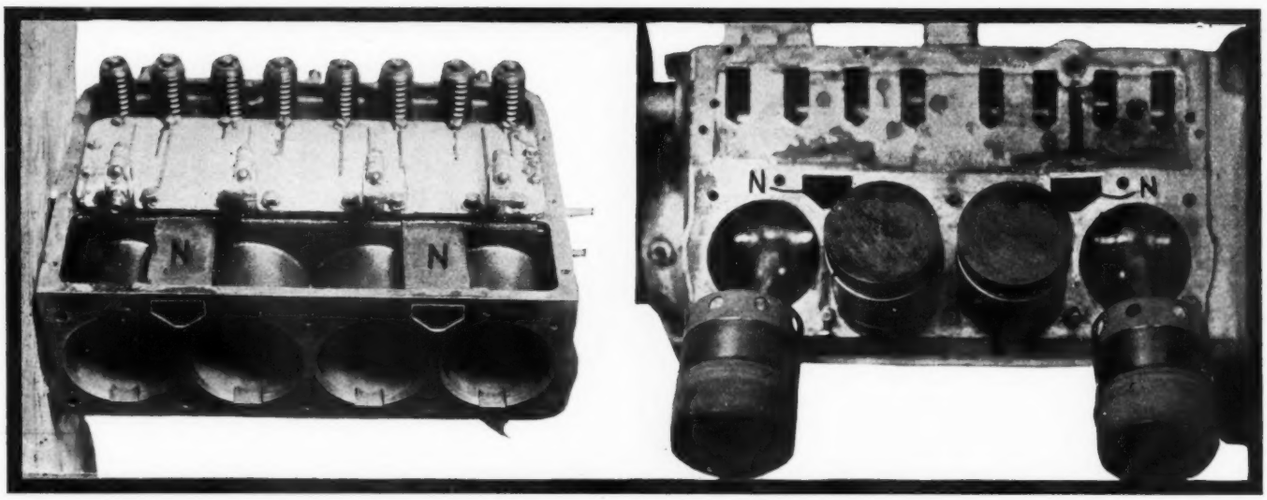


Fig. 8—Duesenberg-Mason motor with intake passages N which connect with the integral manifold in the crankcase and deliver direct to the cylinders. These passages register with openings N in the crankcase, Fig. 9

Fig. 9—Details of pistons in motor, showing recesses in central portion, perforations at lower ends and the use of two rings, each of which is a compound one made up of one full-width outer ring and two narrow inner rings side by side

part of the crankcase, and pass from them into other passages cast integrally with the cylinder casting. Part of the cylinder passages are seen at N. After entering the crankcase at M, Fig. 2, the gas is split up into two parts, passing upward to the intakes, one integral passage going to each two cylinders, thus the gas passes back of the rocker arms, and up to the valves.

The oiling of the motor is interesting. The main crankshaft bearings, connecting rod bearings, and cylinders are provided with lubricant by splash from the dipping of the ends of the connecting-rods into oil troughs. There is a trough for each rod end. The oil flows into the base of the motor which has a capacity of 2 gallons. From this point it is pumped up into the hollow rocker arm shaft and to the four rocker arm shaft bearings and the bronzed-bushed rocker arm bearings. From the latter, it is forced to the cams through oil leads which pass down the rocker arms from their bearings. From the cams the lubricant flows again to the oil troughs under the connecting-rod ends, and its cycle is complete. The four troughs are provided with outlets or regulating tubes which govern the level in them. These regulating tubes are so arranged with slots that by raising or lowering them, the level of the oil may be varied from .25 inch to .75 inch. For racing purposes, the level is regulated for 1 inch.

The feature of the oiling scheme on which the patent is asked is the lubrication of the valve stems. The aluminum coverplate P, Fig. 2, is oil tight, and when the motor is running is considerable speed, the splashing of the connecting-rod ends into the troughs creates a mist of oil which rises through the slots in the top of the crankcase through which the rocker arms pass, and on up to the valve stems, lubricating them. The idea of this scheme is that wearing of the valve guides is prevented, giving the stems perfect contact with the guides. This lubrication of the stems also serves to keep the exhaust valve stems cool, preventing their becoming blue black for more than .25 inch into the valve guide when seated.

Passing from the power plant to the transmission system and running gear, the gearset has three forward speeds, and is mounted at the rear axle, being contained in a special case bolted to the axle housing. The gear ratio is 2.6 to 1. The differential carriers are a part of this case. Special axle shafts are used, the flanges which bolt to the rear wheels being integral with these shafts, F, Fig. 12. This was done with the idea of increasing the strength, thus increasing the factor of safety for high-speed work. The axle shaft flanges F have nothing to do with the holding of the wheels in place, their function being simply to drive.

The propeller shaft is inclosed within a torque tube the rear end of which bolts to the forward end of the gear-box. Two radius rods extend from the front end of the torque tube to the axle housing, in the conventional way.

The front axle, an I-beam type, has a 3 1-2-inch central drop. Front springs are half-elliptic; rear, elliptic. The frame has a 2-inch drop at the dash, and 4.5-inch drop at the rear. Its rear width is 34 inches, and it narrows to 30 inches in front.

The car carries 32 by 3.5 inch tires. Its wheelbase is 104 inches, and its weight about 2,000 pounds.

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In cases where it is desired to attach rubber to metals, this end may be obtained in the following simple manner, given in *Brass World*. To prepare the metal for the securing to it of rubber, it is first electroplated in a suitably concocted solution. The latter, proposed by Leo Daft, Rutherford, N. J., is composed of water and copper, zinc and antimony salts mixed in respective proportions of 60 to 38 to 2. To obtain the salt, the metals are mixed in the given proportions by weight, dissolved in nitric acid and precipitated by a sodium carbonate solution, after which they are redissolved in cyanide. The metal to be plated serves as cathode, while a piece of alloy in the given proportions of the three metals named is the anode. After the metal has been electroplated, the rubber is vulcanized in place.

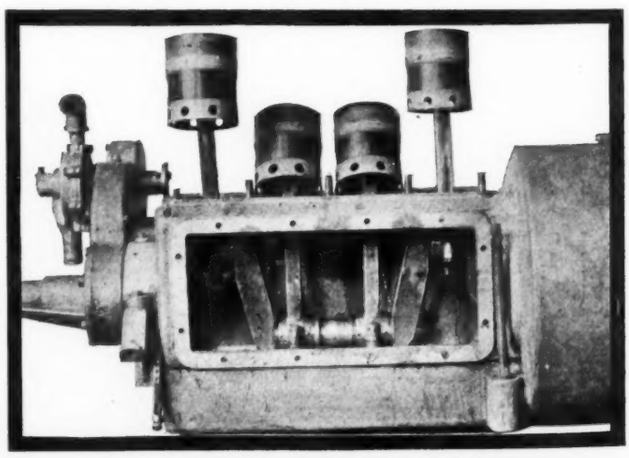

Fig. 10—Crankcase of Duesenberg-Mason motor, showing accessibility of four connecting rod bearings when inspection cover plate is removed

M. A. D. A. Holds Up Cash Prize to Bragg

Milwaukeeans Refuse To Settle Until Driver Pays Entry Fee—Loss at Meet $43,000—Bank Account Attached

MILWAUKEE, WIS., Oct. 21—Bart J. Ruddle, manager of the recent Milwaukee road race, said today, that the M. A. D. A. refuses absolutely to turn over to Caleb S. Bragg the $5,000 in gold offered as first prize in the Grand Prize contest, until such a time as Mr. Bragg pays in cold cash the balance of the entry fee of $1,000, upon which he has made a deposit of only $125 and there is still due $875. Bragg claims he will refuse payment of this fee because no fee was exacted from David L. Bruce-Brown, now dead, and Manager Ruddle declares that this is a poor subterfuge.

The M. A. D. A. lost approximately $43,000 on the speed carnival, and its officers regret deeply that the association's poor position should be taken advantage of by two of the participants, Bragg being one and Ernie Moross being the other. Moross late last week filed a claim for expenses for 14 days for himself, Burman, Horan, Decourcey and Toney, but payment was immediately refused because the Moross outfit played 1 day stands in Pittsburgh, St. Louis and other cities during the time it charged for expenses at Milwaukee. Moross also filed a protest against the award of fifth place in the Grand Prix to George Clark's Mercedes, because he claims Burman was running as well as Clark when the race was called off. It develops from this claim that no fifth place was awarded, Referee A. R. Pardington having placed only four cars which actually finished the race. The M. A. D. A. did, however, make a gift of $500, equal to the fifth place prize, to Clark, who was 40 miles ahead of Burman when the race was called.

The expenses of the meet were approximately $118,000 and the total receipts only $75,000. While no financial statement will be issued to the public, for the reason that the affair is a private matter of the association, it is stated that the principal expense was the construction of the course, upon which $55,000 was expended. The prize list amounted to $20,500, which added to the road expense equals the total revenue.

A garnishee of about $375 placed on the bank account of the M. A. D. A. several days after the races has caused considerable inconvenience, but President Isaac G. Hickman says he is confident that this will be only temporary and the embargo will be lifted before the end of the week. The garnishee served to delay payment of a number of checks, among them that of Starter Fred J. Wagner, whom Manager Ruddle wired on Friday to be patient until early this week, when the matter will be cleared up.

"No one will lose a cent, though our deficit is enormous," said Manager Ruddle. "We are going to pay penny for penny, and what is more, we are going to have the international cup races in Milwaukee in 1913. The matter of financing the deficit is well under way and it will be a matter of only a week or so before we will be able to liquidate every debt contracted legally."

Manager Ruddle will go to New York late this or early next week to make preliminary arrangements for the running of the big cup races on the Wauwatosa course next summer.

Outside of the expenditure of $10,000 by the M. A. D. A. for improving the course for next year, Milwaukee county will put $60,000 into one road forming the course early in the spring. This work will consist of paving the North Fond du Lac road from the city limits to the Town line road with concrete having a roadbed of 25 feet. The work will be started April 1 at the latest and be ready by June 15 or July 1.

It will be news to some people that the proposed improvement of North Fondy road was to have been done this year, and in time for the running of the cup races, but because no assurances could be given by County Highway Commissioner H. J. Kuelling, that the stretch would positively be ready by Sept. 10, the M. A. D. A. requested that the work be held off until the spring of next year.

Ralph De Palma, who was seriously hurt in a collision with Caleb Bragg's Fiat in the last lap of the Grand Prix, is driving a wheeled chair around Trinity hospital and the neighborhood these days. He made his first public appearance on Saturday night, when he wheeled himself into the banquet hall.

ENGINE DIMENSIONS OF THE MASON SPECIAL

Crankshaft bearings:
Front—1.875 inches diameter; 4 inches length.
Rear—1.875 inches diameter; 4½ inches length.
Camshaft bearings:
Front—1.125 inches diameter; 4 inches length.
Center and Rear—1.125 inches diameter; 2 inches length.
Connecting-rod lower bearings—2 inches diameter; 2¼ inches length.
Wristpin bearings—1.125 inches diameter; 2.625 inches length.
Jacket space—.375 inch thick.
Cylinder, and jacket walls—.25 to .3125 inch thick.
Connecting-rod length, center to center, 10.1875 inches.
Length of pistons—4.75 inches.
Piston rings (three of bull-ring type)—inside ring .625 inch wide; outer rings .3125 inch wide.
Flywheel—15.25 inches diameter; weight 60 pounds.
Crankcase opening—5.5 by 16 inches.
Horsepower—58 at 2300 revolutions per minute.
Bore—3.875 inches.
Stroke—5 inches.

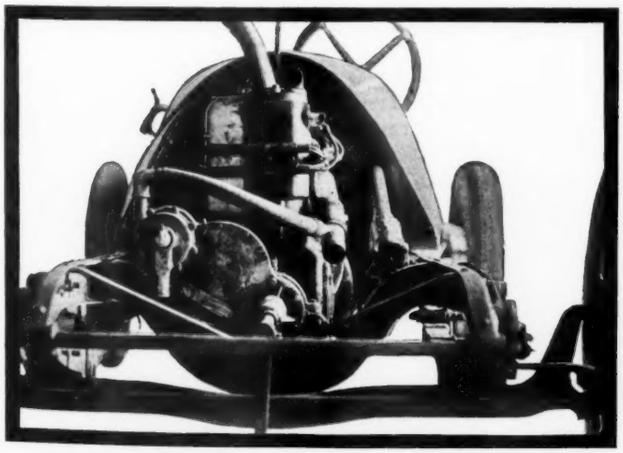

Fig. 11—Front view of Duesenberg-Mason motor with radiator removed. The waterpump location is shown, and also the water intake pipe connections

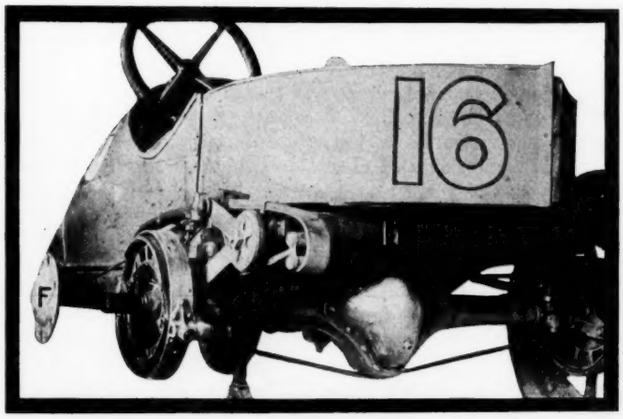

Fig. 12—Rear axle details of Mason racer with axle drive shaft withdrawn, showing integral, drive shaft flange F, which simply drives the wheel

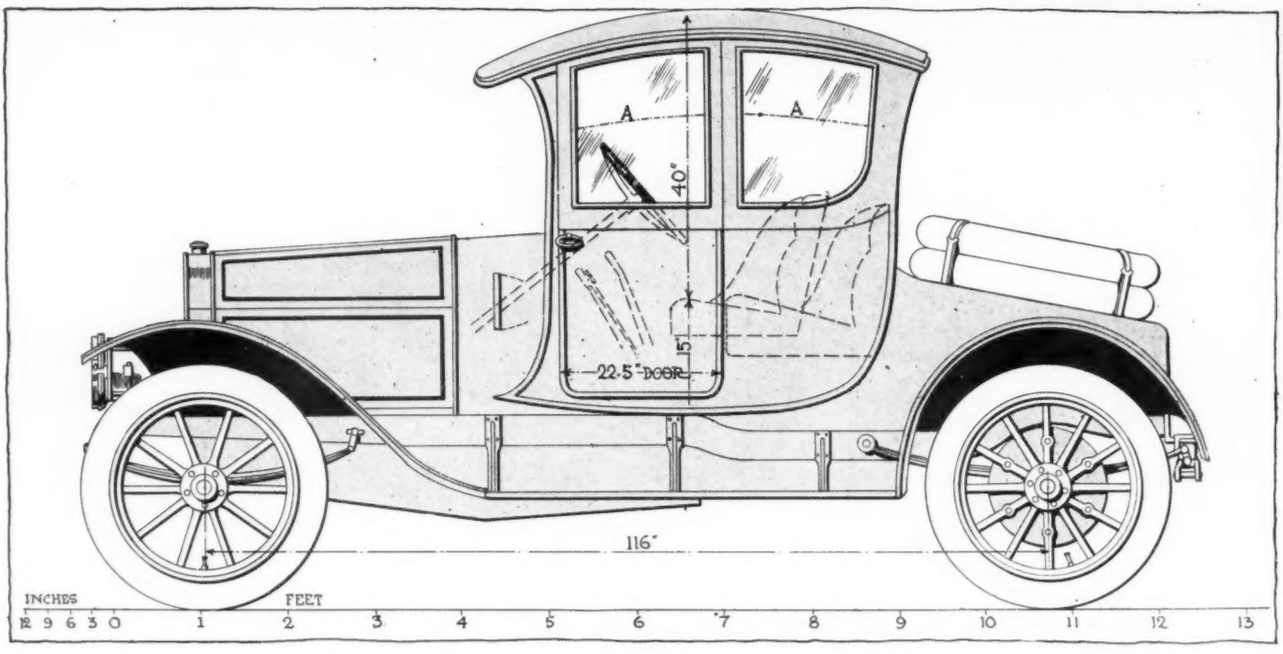

Fig. 1—Side view to scale of coupé design for 1911 Cadillac runabout

Cadillac Coupé Design

Three-Passenger Design for 1911 Cadillac Runabout for $1200—Drawings To Scales Shown

By GEORGE J. MERCER.

NOW that the approach of winter is in sight, car owners who are not already provided for are busy with ideas as to the best method to pursue to make the machine comfortable for use during the cold weather. The question of the cost of a new body or the cost of alterations to the old body and other expenses that a new body design may bring about, such as larger tires, new rear mudguards, changing the dash and gasoline tank, repainting the chassis, etc., resolves itself into these expenses being added up and balanced against what would be a fair increased valuation of the car as a finality. In other words, the business proposition is: If money is to be spent on a new body to be used on an old chassis, how much money should be spent to make the investment profitable?

The present market price of the car, the use and the treatment that the machine has received, which, of course, determines its present usefulness, and the plans of the owner regarding the style of body required, all tend to make the query one that must be answered individually. Therefore, it is proposed to give several successive body designs of coupés and shown on as many different makes of cars. Most of these cars will be of a uniform size that will permit of many of the designs of bodies being transposed to another make of car than the one selected.

The immediate subject in hand, however, and the idea to which this article will be confined, is the description of a coupé body design that is shown mounted on a 1911 Cadillac runabout chassis. This body design has several distinctive features that will be taken up and described in detail as the article progresses, and an early model of the Cadillac car has been chosen because the visible features are not radically different from the latest model. Also, this article is intended to assist the owner who will be most appreciative, and to assist him in making something that is old look like new is consistent with this intent.

The features to be considered when rehabilitating a car of an earlier model are: First, the general condition of the motor, springs, tires, etc., and assuming that these are fairly good, the next step is the consideration of the new parts that are to be added. This model is made to take a coupé body and is so specified in the maker's catalogue, therefore the springs and tires are ample, as the design of body here illustrated is very light and will weigh, when finished, about 550 pounds.

The new parts added to the chassis are the mudguards, front and rear, and a new design of hood. It can be assumed that any car that has been in use for two seasons will have guards and hood that show service, and the replacing of these parts is a cost that can in part be charged up to depreciation. Especially is this true of the guards.

The positions of the gear change and brake levers, the foot pedal and the steering wheel remain normal. The gasoline tank wil require to be shifted toward the rear on account of the seating arrangement. It is moved back about 6 inches or until the seat covers it, or it can be placed in the rear compartment back of the body. The old dash can be made over to the shape of the cowl, provided it is not needed for use when the summer body is replaced. In this instance it will be best to use a new dashboard, and cheaper wood can be used that is customary, because it will be out of sight at all times.

One of the essentials of a body design for a pleasure car is that it be so constructed as to fulfil the requirements specified for the comfort of the users.

A design of body that is intended for use in winter is naturally made heavier than one intended for summer. It must protect the occupant from cold and storm and therefore it is closed in with a permanent and substantial framework and panelling. The proportions inside should be ample and yet no room wasted, and the exterior proportions must not be ungainly.

Common custom has established proportions for the interiors of closed bodies, and these proportions are suitable for the majority of normal persons. The design shown herewith is made in accordance with this rule, and Figs. 1 and 2 show the dimensions for head room and seating arrangements.

This coupé body is designed to carry three people inside, all seats facing forward and each seat is individual, this being accomplished by offsetting the seats as illustrated on the plan view, Fig. 2. The body is made as wide as an ordinary limou-

sine, or 58 inches overall, measured across the widest part, but the taper toward the back and front, as illustrated in the plan, Fig. 3, is sufficient to prevent a bulky end appearance. The extra width in the center of the body is necessary, because the steering wheel in the standard car is so positioned that the seat for the driver must be placed with the inside of the seat approximately in the center of the car, and he occupies the whole right half of the body, however wide it may be. In this case the driver's seat is placed 3 inches toward the right side from the center. The seat on the left side, which is a counterpart of the driving seat, is placed with a space of 10.5 inches between, and this is the width allowed for the knees of the person seated in the middle. This latter seat is set back 7.5 inches and the width necessary for comfortable seating is gained by this offsetting back of the middle seat. The width of the seat-room allowed is 18.5 inches for the driving seat and 17 inches for the other two. The depth is ample to allow of thick upholstery at the back and the seat cushions slope toward the back, the thickness of the forward seat cushion being 5 inches and of the middle seat 8 inches. Extra room on the right side of the driving seat provides ample working space for the change and brake levers, and the entrance to the car on the right side is fairly comfortable, only the levers presenting some difficulties.

A further general description of the interior measurements shows that the head-room allowed over the cushion is 40 inches. This is maximum height for average people, but as the stretch for the limbs is also maximum, the forward seat being back 30 inches from the dash, the height from the top of the cushion to the floor has been made only 15 inches, or 2 inches less than regular. This is a gain of 1 inch off the total height of the body and helps to give a low, rakish appearance. Of course, the arched roof contributes to the low effect. With this the maximum height is obtained at the entrance and the contour of the roof follows a line that approximates the slanting line of the top of the seat cushion.

The windows are a part of the body that require space inside for pockets or grooves to receive them when lowered. On this body design the maximum room inside is required for seating, so the windows are lowered only part way. Line A-A, Fig. 1, shows these side windows in the lowered position. The frameless glass for windows is used on both sides and back, while at the front the glass is bound with a wood or metal frame and made to swing outward as a visor in the customary manner. The method of using the frameless glass has been described in a previous issue of THE AUTOMOBILE and will not be repeated at this time. In regard to its use, there are several good points in its favor, one being that the body is made to look very much lighter. Also, if a good workmanship job is made of assembling the glass into the body, they should last longer and look better when old than those with wood frames, because these latter depreciate quickly. It is no doubt possible to provide for and make tight against the entrance of rain, but this up to the present time is largely an experiment. The appearance of the frameless glass is so striking, however, that it is bound to come into public favor. The glass at the rear of the body is stationary and the front glass is made to swing as previously mentioned.

The lines of a body design that give it a distinctive character and make it stand out as individual are those that depart from the straight horizontals and perpendiculars. There are always enough of these foundation lines in evidence, and, while it is not an absolute rule, nevertheless it is a very general one, that a body line is improved from an artistic point of view whenever it deviates from the direction of these two standards.

A very good illustration of this is the ready acceptance by the public of the sloping hood, as illustrated in Fig. 1. This line is not only more pleasing to look at than the one generally used,

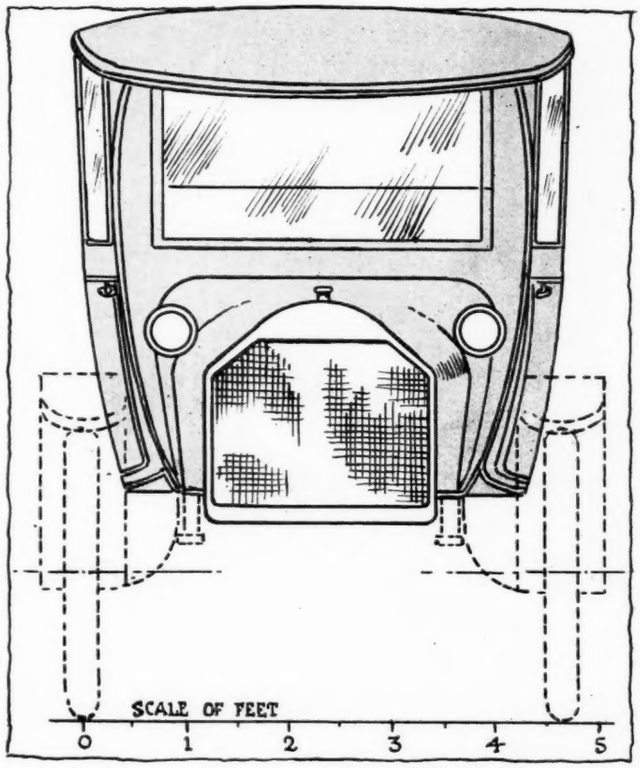

Fig. 3—Front view of Cadillac coupé design

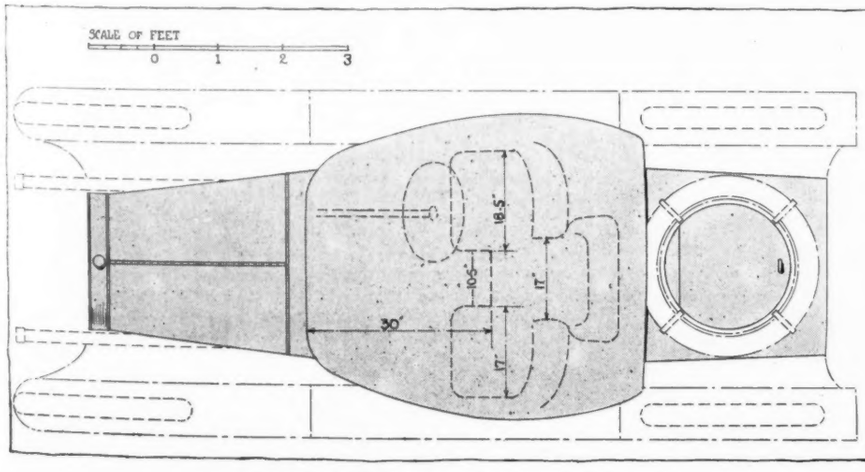

Fig. 2—Seating plan of suggested Cadillac coupé

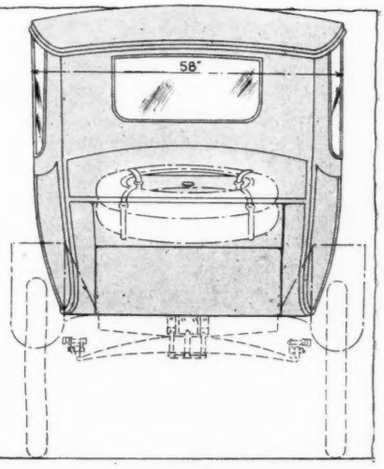

Fig. 4—Rear view of coupé

but it serves the additional purpose of making possible the elimination of the wood dash from sight and decreasing by so much the wind-resisting surface.

With the design as illustrated the upward line of the hood is continued beyond the dash and, to the body proper, this cowl is quite long, because the runabout steering wheel column is long and the body is placed back to accommodate this. If the touring car chassis, which has a shorter column, is used, the cowl will be proportionately shorter. In the sides of the cowl are recesses to receive electric dash lamps, which are of the standard pattern in general use and, together with the dome lamp in the roof of the body, are supplied from a battery located under the seat, the installing and wiring being attended to at the time the body is made.

Attention having been given to the general description of most of the body parts except the rear compartment, it can be briefly summarized as having a carrying space of 38 inches long with an average height of 12 inches and a width of 30 inches. It serves the purpose of a general catch-all and, as in the case illustrated, it may be made tight against rain and water from the washer. Moreover, it may be locked, so that it should be useful and safe to carry all that the owner desires. The top is made strong to carry two tires and the door for entrance is made within the space of the rim. Individual requirements will take up the details of this part, as it may be made in any form that the owner desires.

The question of cost depends to a large extent upon the method of construction, style of trimming, appointments, etc.

The body as designed has the lower panels and the cowl and rear compartment of metal, either steel or aluminum; the framing of good ash; the upper panels of .375-inch whitewood, and the roof of laminated whitewood, with .25-inch plate-glass windows, electric dash and dome lights and battery under the seat. A choice of trimming materials in broadcloths or cords may be made from the best sample books, a choice of style of trimming, with pockets, silk curtains and toilet case to match, choice of carpet rug, a good, common-sense finish and method of workmanship throughout.

Painting the body and mounting on the chassis should cost approximately $1,200. Additional charge for new mud guards and new hood and painting the chassis would amount to approximately $200. Tire holders of a simple pattern should be furnished with the body without additional charge.

This approximate expense of $1,400 has to be mentally balanced against the possible extra service that the car will give, if it is so equipped. Is the car worth this added expense if sold in the open market? This and other questions will have to be answered individually. The field is a large one and this is presented as one of the possibilities. The design of body is sensible; it is roomy, and if built by a reputable builder it will wear well and give service for a long time, because the weight is under the average. As the design is well in advance of the general style it will even up until it is worn out.

The most appropriate colors for a design as illustrated will be either a dark green or blue with the trimming either of a shade to match or a decided contrast and much lighter. The silk curtains and the carpet should always match the cloth. This question of trimming and the colors for the painting are best selected from samples, which any bodybuilder could supply. The principal task is the decision of a suitable body design, and the one here presented is suitable for almost any car having a wheelbase of from 110 to 125 inches. Each seat being individual the car is capable of accommodating three people comfortably, thereby avoiding the unpleasant crowding of three people on one seat. A roomy carry-all is arranged on the space behind the body. The front need not be made with a sloped hood if the extra expense is a consideration. Having decided on a body design, close figuring can be used to trim out the fancy features, and while the body will not be as good as if more money was spent on it, nevertheless a great deal can be accomplished with a little money if the buyer is in earnest.

Progress in Automobilism

English Engineer Reviews Advances of the Year—Paraffin as a Fuel, Quietness, Lubrication and Cleanliness Featured

Extracts from Address of President T. B. Browne Before Institution of Automobile Engineers in England

IN London alone there were licensed during the year ending August 31 last 2,510 motor omnibuses as against only 533 drawn by horses; the number of motor cabs licensed for the same period was 7,860 with only 672 hansoms and 1,982 four-wheeled horse cabs.

That the cost of running commercial motor vehicles is being continually reduced, especially where efficient organization exists for their maintenance in large numbers, is shown by the fact that one of the largest motor omnibus companies has now reduced its running costs to about 15 cents per car mile, whereas when I read a paper on the subject of running costs before this Institution in February, 1910, the equivalent figure was about 18 cents, so that the motor omnibus is now in a better position to prove a very formidable competitor to the electric tramcar.

It is very difficult to arrive at an exact estimate as to the number of motor vehicles running in this country, as there is at present no arrangement made for striking off the register those vehicles which are worn out, destroyed by fire, etc., but the total numbers registered for Great Britain and Ireland have been given as follows:

November, 1910	Motor cars	124,860
	Heavy motor vehicles	7,406
November, 1911	Motor cars	150,697
	Heavy motor vehicles	9,195

As nearly a year has elapsed since the last figures, the approximate number of registrations at the present time might be estimated as follows:

Motor cars	170,000
Heavy motor vehicles	12,000

Excellent results have so far been obtainable with paraffin with engines running on steady loads, but the extremely irregular load of an automobile engine has so far proved a serious obstacle to the proper carburetion of paraffin and the heavier oils. There is also the possibility that the price of any substitute will rise as soon as the demand for it becomes great, just as has been the case with the price of the heavy oil used in the Diesel engine, which was sold not so long ago at 38s., or $0.50 per ton, whereas it has now risen to over $20 per ton. However, it cannot be gainsaid that the whole question is one of supply and demand, and therefore the greater the number of satisfactory substitutes for petrol that are found the lower the price is likely to be. The enormous increase in the number of commercial motor vehicles that we are about to witness should not tend to raise the price of petrol for pleasure cars, if we are able to use a heavier oil as a fuel for the propulsion of the former. Petrol is distilled off the crude oil at temperatures ranging from 50 deg. C. to 150 deg. C., but if we can use an oil distilled off at a temperature range of from 50 deg. C. to 200 deg. C. the supply would be increased threefold; so that it can readily be perceived how this would affect the price of the fuel to the consumer.

No serious attempt to use the Diesel principle for automobile propulsion has yet been made, and there are, of course, considerable difficulties in the way which must be overcome before it can be successfully applied.

In the first place, with the comparatively small powers required, it would be very difficult to reduce the weight sufficiently to enable it to compare favorably with the petrol motor, and the mechanical efficiency of these small sizes would in all probability be rather low. Then, again, great difficulty would be found in applying it to the irregular loads and speeds of an automobile, so that much experimental work would have to be done before success could be expected. The success which has resulted with the use of Diesel engines on ships where these objections do not apply can, therefore, be no guide as to its suitability for automobile work.

The use of solid fuel in the shape of carbon has been proposed for automobiles, and at least one vehicle has been built with a suction gas producer. This would have to be designed

on much lighter lines, and of smaller dimensions, than those at present used so successfully and economically with stationary gas engines, but those who have made a special study of this system, and who are therefore qualified to know, have stated their opinion that it should be quite practicable to bring the dimensions and weight of the apparatus down to the required limits without impairing its efficiency, so that the subject is well worth the consideration of designers, at all events for the heavier types of motor vehicles, though difficulties will probably occur in regulating the gas supply to suit the irregular load experienced with an automobile.

At the recent meeting of the British Association some of the papers read were of the greatest interest to automobile engineers, and I might specially refer to those read by one of our past presidents, Dr. Dugald Clerk, F.R.S., on the subject of gaseous explosions and internal combustion turbines.

The interesting point with reference to explosions brought out was the difference in the time taken to explode a gas when in a state of turbulence, and when in a state of comparative rest. In the experiments quoted a fan was used to create a turbulence in a 10 per cent. mixture of coal gas and air, with a result that the time of explosion was shortened from 0.13 seconds to 0.03 seconds when the speed was raised from 2000 to 4500 revolutions per minute.

This result accounts for the fact that it is possible to obtain satisfactory ignition with motors running at high speeds.

Perhaps the work which has been done of recent years in studying the indentations caused by phonographic records may lead us to some definition of "amount of noise," but the fact is that no one has as yet suggested a definition for a unit of either noise or smell.

The noises in the transmission gear of an automobile proceed from several sources. The most troublesome of these is undoubtedly that caused by the gear wheels of the change-speed gear. With the universal adoption of direct drive on the top gear, this can only occur when recourse is had to the lower gears, when the drive is transmitted through two pairs of spur wheels in the gear box. The introduction of ball bearings has intensified the trouble from this source, as it is well known that plain bearings do not conduct the sound emitted by the gear wheels to anything like so large an extent as ball bearings. Some experiments which I conducted with ball bearing camshafts several years ago bore this out to a surprising degree.

Another serious source of noise has been that due to the bevel gear used in the transmission. In chain-driven cars great difficulty was experienced in quieting the bevel gear owing to the comparatively high speed at which it was run. Its removal to the back axle, with the introduction of the live axle, rendered the problem not quite so difficult, but it has still been found a very serious one. **It has also been found extremely difficult to prevent the teeth of the bevel gears from warping during hardening. Here again great improvements have been made by the adoption of a process for the local hardening of the teeth, leaving the disc of the wheel soft, and by making the back axle as compact and rigid as possible.** The fact remains, however, that no spur or bevel drive in the transmission of an automobile ever gives absolute silence, although by the methods mentioned above the noise can be considerably reduced.

For this reason there is a tendency towards the adoption of worm gear, which has been delayed in many cases by the fear that this would be less efficient than the bevel gear. In some instances where it has not been carefully designed, this has certainly been so, but some recent experiments carried out in America have proved that the difference in the efficiency of the two types of gear is negligible where properly designed gears are used.

The difficulty with the splash lubrication was chiefly due to the fact that the connecting rod big ends which dipped into the oil were of such comparatively large dimensions that a slight rise in the level of the oil by reason of the tilting of the car due to a gradient or the movement of oil due to its inertia, caused a very much larger amount to be thrown up than the normal.

At last a thoroughly efficient way out of the difficulty was found, and was first tried by one of the London omnibus companies. This consisted in fitting a small vertical pipe to the lowest point of each big end, the lower end of the pipe being arranged in the form of a small scoop. The level of the oil was reduced correspondingly, so that, the orifice of the scoop being quite small, a very little extra amount of oil was splashed up by the scoop on to the sides of the cylinders if the level were temporarily increased by tilting, etc.

The oil into which the scoops dip is usually carried in small troughs situated under each scoop, so that the tilting of the engine does not materially affect the level.

This method has been found most efficient, and since its adoption the unpleasant smoke from the exhaust of automobiles has become a thing of the past.

A very great improvement has been recently made in the cleanliness of the automobile by the prevention of drippings from gear boxes and axle cases by the provision of a vent in the shape of a small aperture in the top of the case fitted with a short length of tube open to the atmosphere. It was found that the rise of temperature due to the churning of the oil often resulted in a rise of pressure in the gear case of as much as 4 pounds per square inch, which accounted for the fact that, in spite of careful provision in the shape of stuffing boxes, the oil still worked out and dripped on to the road, or found its way on to the surfaces of the brakes.

One of the chief causes of the unpleasant odors emanating from the automobile in the early days of the movement was the imperfect mixture, resulting in the products of the partial combustion, including the deadly carbon monoxide, being expelled into the atmosphere.

With modern carbureters, the variations of which are innumerable, there should be no excuse for any emission of unpleasant exhaust. At the same time it must be stated that a good many cars are run to-day with a much richer mixture than is necessary for perfect combustion. It is well known that a certain percentage of mixture too rich for perfect combustion gives slightly more power than the perfect mixture, but the gain is so slight that it is certainly not worth using for any but racing purposes, and it has the further disadvantage of increasing the tendency to carbon deposit.

There is still, of course, room for improvement, and such parts as the tires and springs are obviously very far from having reached their final stage of development.—From *The Autocar*, October 12, 1912.

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Harking Back a Decade

FROM *The Automobile and Motor Review*, October 18, 1902:

The great reliability run of the Automobile Club of America was finished at New York on Wednesday evening. There were seventy-nine entrants and sixty-five covered the route to the end. According to unofficial announcement there were twenty cars to complete the whole course without penalization. Of course, this list is subject to alteration when the judges, umpires, referees and officials have considered the results from all angles. In the honor list are four Whites, two Packards, two Grouts, two Stevens-Duryeas, two Searchmonts and one each of the following makes: Prescott, Lane, Haynes-Apperson, Knox-mobile, Stearns steamer, Oldsmobile, Fredonia and Foster. There were thirty-five different makes represented in the run. During the whole affair not a single serious accident occurred as the result of horses becoming frightened by the tourists. Entering Boston the column contained at least 300 automobiles. The run was from New York to Boston and return. The contestants were classified into three divisions according to weight in running condition without passengers. Class A was for cars under 1,000 pounds; Class B, 1,000-2,000; Class C, over 2,000 pounds. Of the clean score cars there was one in Class A; fifteen in Class B and four in Class C. There were ten steamers in the perfect score list and ten gasoline cars. Class A cars performed well, but the honors of the run went to those in the middle class. Practically all the disabling mishaps that occurred to contestants in this class were due to accidents. There was a big handicap on the heavy car class on account of the low average speed allowed by the rules. Poor workmanship and construction led to quite a number of penalties to some of the entered cars, but these were not very serious.

The new plant of the Winton Motor Carriage Company, at Cleveland, O., is located on a site of 12 acres. The four buildings, which are all of one story, cover an area of about 100,000 square feet. A feature of the building is the fact that the structural framework is raised in the center of each to provide windows and skylights from above.

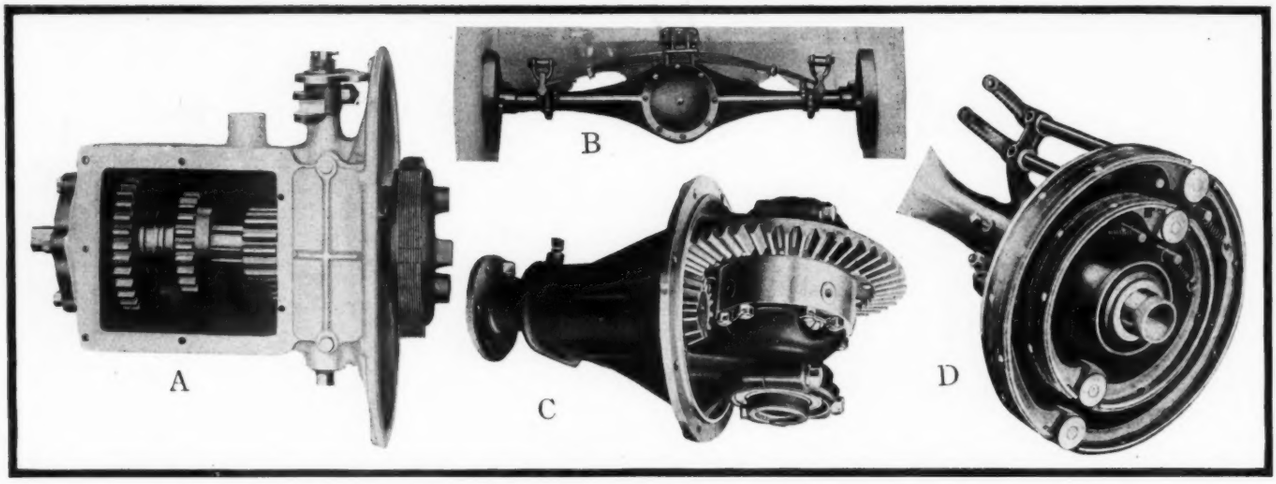


Fig. 1—Gearset, axle, differential and brakes in the Detroiter car, showing principal features of each

Detroiter Embodies Latest Improvements

Left Drive, Center Control, Long-Stroke Motor, etc., Found in Product of 2-Year-Old Company

BEGINNING its second year, the Detroiter does not show any changes in a mechanical way. Some of the body lines have been straightened out giving a very graceful design which taken in conjunction with the long cowl gives the car an excellent appearance.

The motor is of the monobloc type, the four cylinders having the waterjackets cast integrally. The intake manifold passes through the casting in a unique manner, the intake pipe from each cylinder passing between the cylinder from which it leads and its neighbor and projecting from the opposite side of the monobloc casting. The passages are thus between the first and second cylinders and between the third and fourth; the pipes which pass between each of these pairs suffice for the two cylinders between which they pass. The passage is beneath the waterjackets and not through them so that the water circulation is not interfered with by this arrangement while all the advantages of a preheated charge are obtained. The intake manifold is Y-shape, each branch of the Y connecting to one of the intake leads. The carbureter is carried on the bottom of the Y as shown in Fig. 2. The short pipe above the intake is the water inlet.

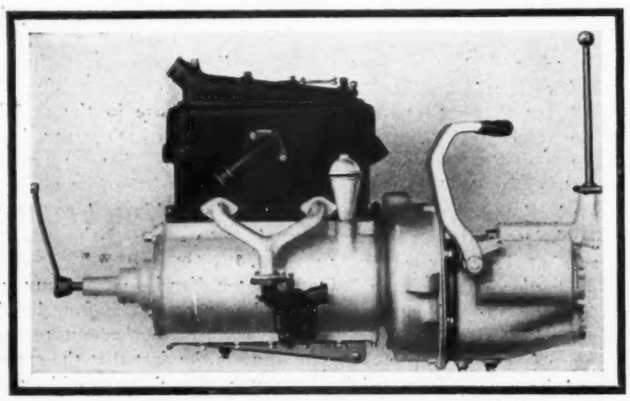


Fig. 2—Left side of unit power plant, showing carbureter mounting

The bore of the motor is 3 3-8 inches and the stroke is 4 3-4 inches. This gives a stroke-bore ratio of 1.4, which is somewhat higher than usual practice in the lower priced cars and should give good reserve power for hills at the same time making the motor economical as to fuel consumption. The material from which the cylinders are made is soft gray iron. The pistons also are composed of this material. A feature of the design of the Detroiter which is unusual is the reaming of the cylinders and the grinding of the pistons to exact diameter, 3.375 inches. The pistons are 4 3-4 inches in length and fitted with three concentric rings all of which are located above the wristpin. Before assembling the motor the complete set of four cylinders is weighed and balanced exactly to secure smooth running as far as this can be done by a static balance. A running balance is obtained on all rotating points cutting down vibrations to a minimum.

Other parts of the motor follow standard practice and design. The connecting rods are of I-beam section, and are carbon steel drop forgings heat treated. They are balanced in the same manner as the pistons. The connecting-rod bearing at the crankpin end is of square projection, measuring 1 7-8 inches each way. The crankshaft is a high carbon steel drop forging carried upon two large heavy duty annular ball bearings. The grinding work at the bearing surfaces is done within extremely narrow limits to give a maximum life of both the shaft and the bearings.

Silence in the valve action of the Detroiter has been obtained by enclosing this part of the motor by oil-tight and sound-proof casing, Fig. 4. The valves are made in two parts welded together by a new process. The heads are of gray iron while the stems are of low carbon steel. They are all of the same size and interchangeable in every way. The action of the valves is adjustable in the usual way by turning a nut on the end of the valve stem. The nuts are of unusual size, however, to distribute the wear over a larger area and render frequent adjustment necessary. The push rods operate in bronze bushings which can be renewed when necessary.

Careful grinding is a feature of the camshaft, the limits being 1-1,000 inch throughout the length of the cam and bearing surfaces. The bearings are ground to .937 inch in diameter and the lengths of the bearings are 2 1-2 inches at the end and 1 1-4 inches in the center. The camshaft is actuated from the rear of the motor. The timing gears in the Detroiter being located at this end of the motor, it has been found easier to lubricate them in this position and they have also been rendered less noisy. The gears are cut helically and are three in number. The crankshaft and magneto gear are of steel while the central time shaft gear is composed of special gray iron. The gray iron timing

gear is bolted to a large flange forged directly on the camshaft for this purpose to overcome the objections to keys.

The oiling system used is the circulating splash. The oil is carried in the lower part of the crankcase and is drawn from there by a circulating pump which sends the lubricant through a sight feed located on the dash. From the latter point the oil flows to the forward end of the crankcase and then passes through a system of four-splash troughs, one being located beneath each cylinder. The connecting-rods dip into the oil contained in these troughs and splash the oil to the cylinders, crankshaft, camshaft and all the internal bearings of the motor. In addition to this, the flywheel runs in oil and lubricates the clutch and gearset. Excess oil drains back to the reservoir through standpipes and is recirculated through the system after having passed through a fine mesh strainer.

The cooling system is thermo-syphon, operating through a vertical tube radiator having three tiers of copper tubes. The face area of the radiator is 24 by 26 inches. Large waterjackets are used in connection with this system to facilitate the circulation and make it as rapid as possible. A fixed spark Bosch high-tension magneto is used.

Power is transmitted through a multiple-disk clutch to the three-speed gearset. The clutch consists of twelve internal and eleven external crucible steel disks housed within the flywheel. It runs in a continual bath of oil and engagement is secured by three large helical springs. The gears in the gearset have a 3-4-inch width of face, a large engagement area being thus secured. The gears are of high carbon steel heat treated and hardened in oil. The main and lay shafts are carried on heavy duty annular ball bearings. Practically the entire gearbox can be disssembled through the handhole on the side. The gearbox is suspended by a sub-member to the main frame and forms the rear member of the three-point suspension.

From the gearbox, the drive passes through a universal joint to the propeller shaft and thence through another universal joint to the bevel gear differential. The differential and drive gear assembly are of unit construction, the bevel drive gear or pinion being capable of removal by taking the cap from the rear axle, shown at B, Fig. 1. The drive pinion shaft shown at C is mounted on a double-row ball bearing at the gear and next to the pinion and on a single-row ball bearing at the forward end. The differential set is carried on two large double ball bearings,

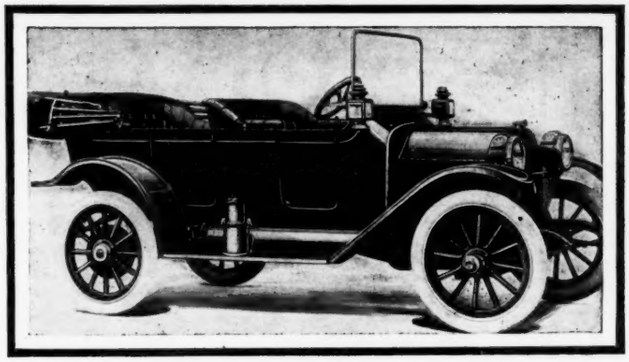


Fig. 3—Five-passenger touring car on the Detroiter chassis

one on each side of the gear. The ratio between the bevel gear and the pinion is four to one. The teeth are five diametric pitch with the short addendum formation and have faces 1-4 inch in width.

The rear axle is of floating construction with a pressed steel housing. The housing, which sustains the weight of the car in this construction, is designed to carry 3,000 pounds which is more than three times the weight that can ever be placed upon it when the car is loaded. The axle is shown at B, Fig. 1. As will be noted in this illustration, the rear spring is of the platform type. The springs throughout are 1 3-4 inches wide and supplied with rebound clips. The front springs are semi-elliptic, attached to swivel shackles, while universal shackles are used in the rear. All bearing points are taken care of by grease-cups.

Two sets of brakes working on double drums are employed. These are shown in Fig. 1 at D. Both brakes are of the internal expanding type. The service brake is 14 inches in diameter and the emergency brake 10 inches.

Heavy frame construction is used, the channel members being 33 inches wide in the rear and 29 inches in front, with a drop of 3 inches forward of the rear axle. The car can be turned in a 25-foot circle. Steering is taken care of by a worm and sector gear actuated by a 17-inch steering wheel. Left drive and center control are used in the Detroiter, a complete model of which is shown in Fig. 1. Tires are 32 by 3 1-2 inches and the color is Raven blue relieved by a light blue stripe.

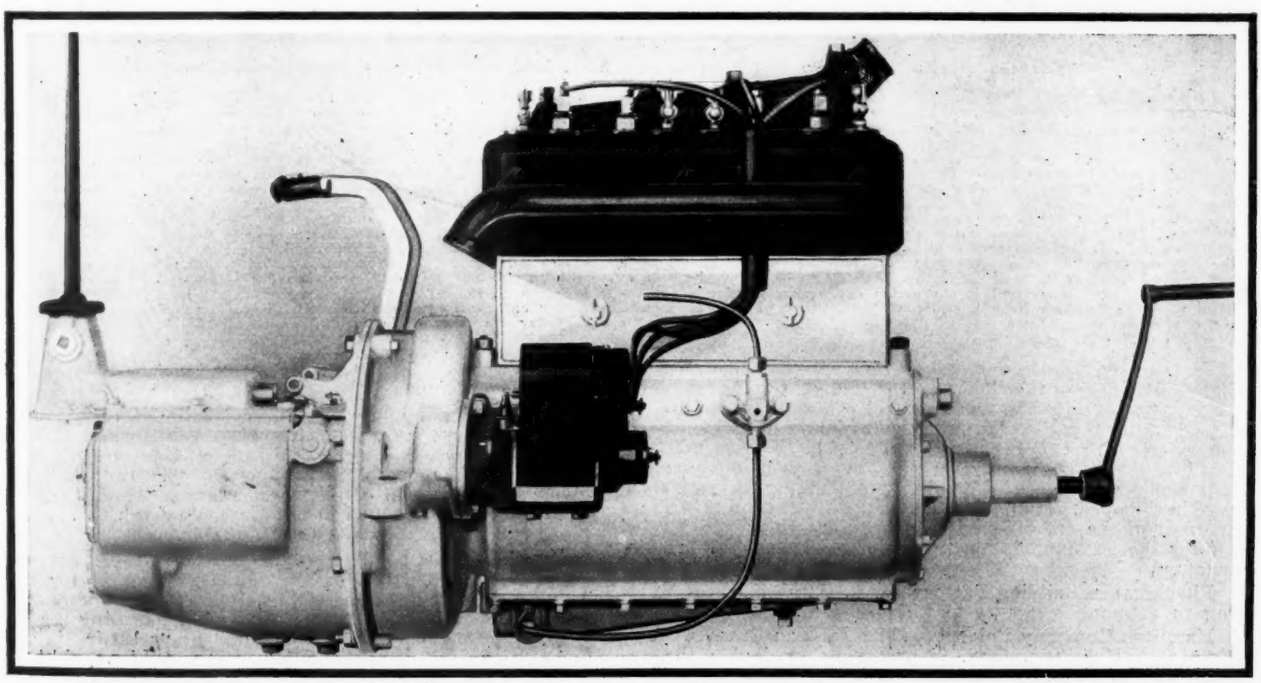
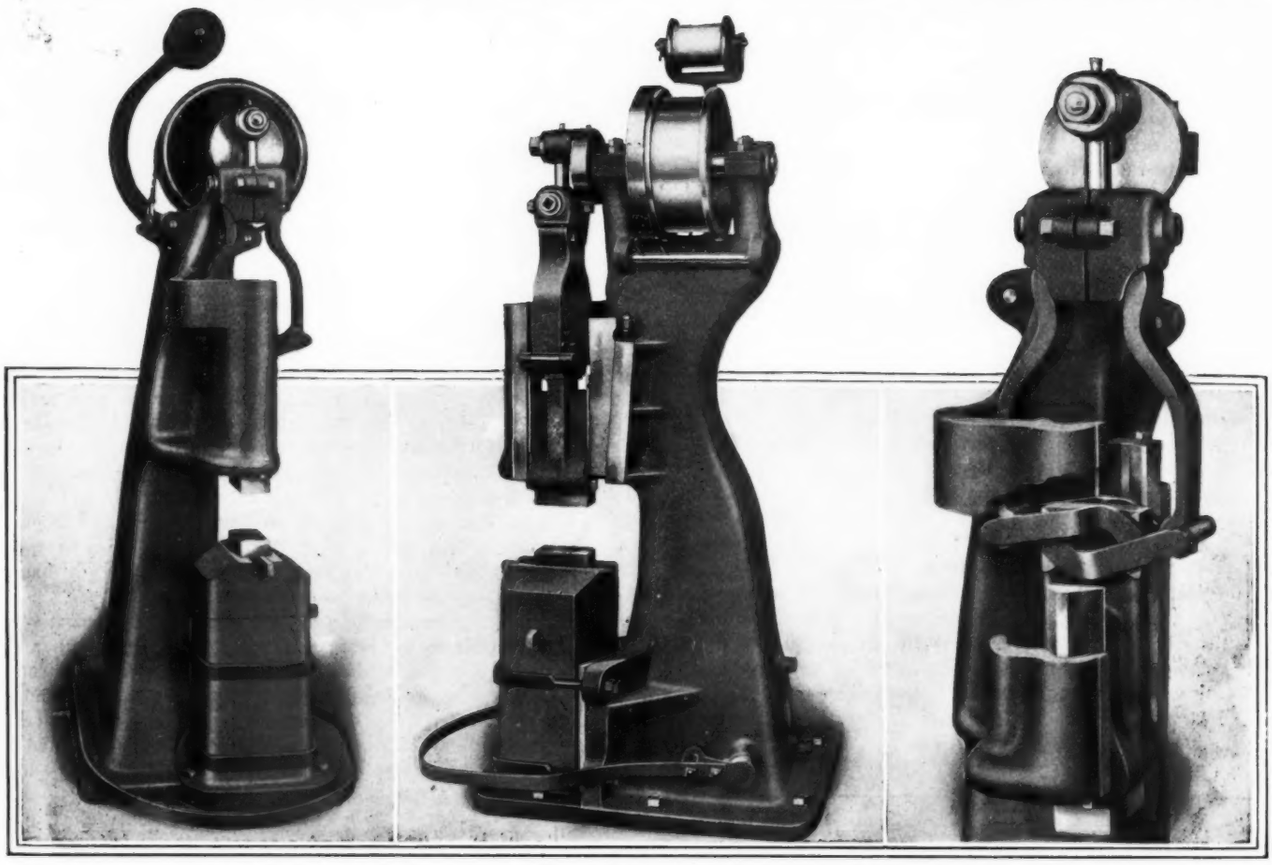


Fig. 4—Right of valve side of motor, showing magneto mounting and lead from oil reservoir to the crankcase

Factory Miscellany



Front, side and constructional view of the Beaudry Peerless ham mer which is especially adapted for tool making

In the accompanying illustration is shown a new hammer brought out by Beaudry & Company, of Boston. While also a hammer for general forging work it is especially adapted for plating and drawing steel. The feature of the hammer is its extreme quickness of blow. It is designed for continuous service and can be operated at a very high rate of speed. The hammer is made in seven sizes with rams which range between 25 and 200 pounds. The weight of the entire machine is from 1,200 to 4,400 pounds, according to the size. Another feature which distinguishes this hammer from most others is that it has no beam, coil springs, leather straps or rubber cushions. The hammer is started, stopped and regulated by a treadle which extends nearly all the way around the base, rendering it possible to operate the hammer from any side. A varying pressure on the treadle will give any desired speed or force of blow, thus allowing an experienced workman the greatest play. The anvil is a separate casting and is flanged at the bottom for the bolts which hold it to the frame. A wood filler is inserted between the anvil and the frame to eliminate vibration. As shown in the above illustrations the anvil is also secured to the frame by strap bolts and is offset so as to clear the main frame casting. The anvil has an independent and adjustable shoe die. The frame of the hammer is cast in one piece and is very rigid. It occupies but little floor-space, having a foundation of moderate size. The ram operates in V-shaped guides, it is composed of carefully machined steel and is adjustable on the connecting rod for varying heights above the dies. At all parts of the stroke the frame is contained within the guides to insure a true blow. The treadle works in conjunction with a belt-tightening pulley and a friction band brake which is capable of instantly starting or stopping the hammer. The hammer responds to the slightest pressure of the treadle and may be operated from any side. One man, of course, can take care of the hammer and do all the work with it. A highly trained man who has specialized on a hammer of this type can do wonders with it in the tool-making line, leaving very little for subsequent expensive grinding work to do. Such hammers as this are in everyday use in automobile factories all over the country.

BUSINESS Outgrows Baker Factory—The electric truck business of the Baker Motor Vehicle Company, Cleveland, O., has grown so rapidly that the business has outgrown the plant, and it has lately been found necessary to do part of the work in the open. The accompanying illustration shows several piles of pressed steel frames. The preliminary work of drilling and cleaning is being done here in the open. It may be seen in the illustration that about 100 feet of the embankment has been cut away and leveled off for the accommodation of the pressed steel frame shipments.

Fitzsimmons Building Factory—J. A. Fitzsimmons is building an automobile factory in Lindsay, Ont.

Hamilton Company Enlarged—The Tallman Brass & Metal Company, Hamilton, Ont., is preparing to double the capacity of its plant.

Wheel Company Adds—The Ideal Steel Wheel Company, Cincinnati, O., has bought the former plant of the Seufferle Cooperage Company, that city, for $41,000.

Wallis Company Working—The Wallis Tractor Company, capital $800,000, organized at Racine, Wis., by H. M. Wallis and other interests identified with the J. I. Case Plow Works, will engage at once in the production of tractors, tools, machinery and internal combustion engines. Temporary quarters have been arranged in the Case plow works, but a new plant will be erected as soon as possible.

Premier Adds to Plant—Two new additions are to be made immediately to the plant of the Premier Motor Manufacturing Company, Indianapolis, Ind. The company at first intended to wait until next spring before enlarging the plant, but it is stated that the demand for the new Little Six makes more room necessary before then. The additions will be two stories in height, one 40 feet by 140 feet and the other 48 feet by 140 feet.

Vulcanizing Plant—The Middletown Automobile and Bicycle Company, Middletown, O., is now receiving bids for a new vulcanizing plant.

Rim Company Building—The Jackson Rim Company, Jackson, Mich., has awarded a contract for a one-story factory to be 400 feet by 80 feet and to cost $40,000.

Maritime Company Building—The Maritime Motor Car Company has placed a contract to build an automobile factory at Coldbrook, N. B., at a cost of about $250,000.

Chalmers Plans Addition—The Chalmers Motor Car Company, Detroit, Mich., has plans in progress for a one-story addition, to be 140 feet by 60 feet, and to cost $20,000.

Electric Company's Factory—The Century Electric Company, St. Louis, Mo., is having plans prepared for a seven-story factory 75 feet by 110 feet. It will cost $150,000.

Indianapolis Company's Addition—The Motor Car Company, Indianapolis, Ind., has awarded its contract for the building of an addition to be 450 feet by 50 feet and of fireproof construction.

Resilio Company Builds—The Buffalo, N. Y., Resilio Company, recently incorporated, will build a plant for the manufacture of resilio and other substances used in the making of tires for automobiles.

Lewis Acquires Detroit Plant—It is reported that the Lewis Spring & Axle Company, Jackson, Mich., has acquired a factory in Detroit, Mich., and will remove its automobile control department to the latter city.

Chain Firm Builds—The Whitney Manufacturing Company, Parkville, Conn., which manufactures chain drives for automobiles, is to erect a $40,000 addition to its plant. The new structure will be 40 feet by 180 feet and two stories high.

Plans Rubber Tire Factory—Rubber tires for all kinds of motor vehicles are to be manufactured by the St. Louis, Mo., Tire and Rubber Company. The company is to be capitalized at $150,000, and a site has already been chosen for the factory.

Bulldog Tire's Factory—The Bulldog Tire Company, Ltd., Toronto, Ont., has been incorporated with a capital stock of $300,000 to manufacture tires for automobiles, etc. Plans for a factory are being considered. William J. Tubman will be the manager.

Amesbury, Mass., Growing—The Walker & Wells Company, makers of automobile bodies at Amesbury, Mass., is having completed an addition to its factory of a building 40 feet by 100 feet, two stories high, to be used for the storage of lumber and metal.

Hardman Tire Plant Burns—The plant of the Hardman Tire and Rubber Company, Belleville, N. J., was destroyed by fire on September 26. The three-story brick building occupied an entire block, and was used, with the exception of one corner, by the Hardman company.

New Des Moines Factory—Des Moines, Ia., is to have a new automobile factory to be known as the Cannon Motor Car Company. The site of the new factory has not been determined upon. Two locations are already in view and a choice will be made in the near future.

Cutting Plant Enlarged—The Cutting Motor Car Company, Jackson, Mich., has made arrangements to double the size of the plant and additional land next to the factory has been purchased for that purpose. The new factory will probably be in course of erection by next spring.

Agner Company Moves—The Raymond C. Agner Company, Burlington, Wis., manufacturing adjustable socket wrenches, grease and oil guns and other specialties, is now located in its new factory, erected at a cost of $30,000. The output has been increased by 75 per cent.

Pope's Four-Story Structure—The Pope Manufacturing Company, Hartford, Conn., is completing plans for the construction of a four-story factory which is to be devoted to the production of a line of lower priced cars. It is said that this structure will double the capacity of the plant.

Amplex Will Enlarge—The Amplex Motor Car Company, Mishawaka, Ind., is planning to double its factory capacity so that all parts of its car will then be made at the Mishawaka factory, including the aluminum bodies. The company will in a short time put on a larger force of workmen.

Body Plant Enlarged—The W. F. Stewart Company, Flint, Mich., manufacturer of automobile bodies, has awarded a contract for the erection of an addition to its plant. The new building will be 60 feet by 200 feet, two stories high, and will permit the company to double its capacity.

Kelly-Springfield Plans—The incorporation of the Kelly-Springfield Motor Truck Company, Columbus, O., recently, was the first step in extensive plans for the expansion of the company. The old plant at Springfield, O., is being considerably enlarged, and it is expected that the output for the next year will be in the neighborhood of 1,000 vehicles.

Calendar of Coming Automobile Events

Shows, Conventions, Etc.

Jan.	2-10	New York City, Importers' Salon, Hotel Astor, Importers' Automobile Alliance.
Jan.	4-11	Cleveland, O., Annual Automobile Show.
Jan.	4-11	Montreal, Que., Montreal Motor Show, Drill Hall and 65th Regiment Armory.
Jan.	11-25	New York City, Thirteenth Annual Show, Madison Square Garden and Grand Central Palace, Automobile Board of Trade.
Jan.	20-25	Philadelphia, Pa., Annual Automobile Show.
Jan.	25-Feb. 1	Montreal, Que., Automobile Exhibition, R. M. Jaffray, Manager.
Jan.	27-Feb. 1	Detroit, Mich., Annual Automobile Show.
Jan.	27-Feb. 1	Scranton, Pa., Annual Automobile Show, Hugh B. Andrews.
Feb.	1-8	Chicago, Ill., Annual Automobile Show.
Feb.	10-15	Minneapolis, Minn., Annual Automobile Show.
Feb.	11-15	Ottawa, Ont., Annual Automobile Show.
Feb.	17-22	Kansas City, Kan., Annual Automobile Show.
Feb.	24-Mar. 1	Cincinnati, O., Annual Show, Music Hall, Cincinnati Automobile Dealers' Association.
Feb.	24-Mar. 1	Omaha, Neb., Annual Automobile Show.
Feb.	24-Mar. 1	St. Louis, Mo., Annual Automobile Show.
March	3-8	Pittsburgh, Pa., Annual Automobile Show.
March	8-15	Boston, Mass., Annual Automobile Show.
March	17-22	Buffalo, N. Y., Annual Automobile Show.
March	19-26	Boston, Mass., Annual Truck Show.
March	24-29	Indianapolis, Ind., Annual Automobile Show.

Race Meets, Runs, Hill Climbs, Etc.

Oct.	21-25	Reliability Run, Chicago Motor Club.
Oct.	24-26-27	Track—San Antonio, Tex., San Antonio Auto Club.
Oct.	26	Track—York, Pa., York Motor Club.
Oct.	26-28	Los Angeles to Phoenix Road Race, Maricopa Auto Club.
Oct.	31	Track—Phoenix, Ariz., Maricopa Auto Club.
Nov.	9	Sociability Run, Louisville, Ky., Louisville Automobile Club.

Proposed Contests

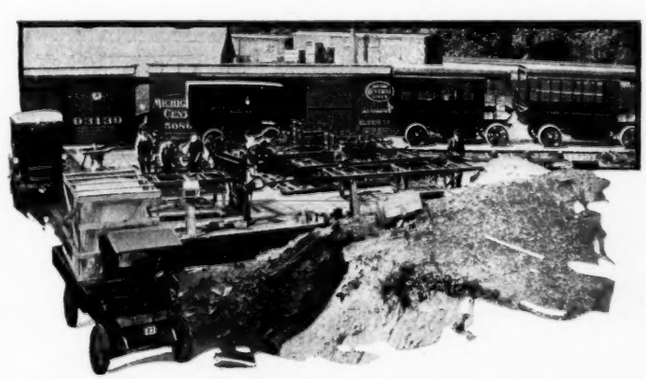
Oct.	26	Track—White Plains, N. Y., Geo. T. Long.
Nov.	3-5-6	Track—Shreveport, La., Shreveport Auto Club.
Nov.	15-16	Track—Richmond, Va., Richmond Automobile Club.
Nov	28	Road Race—Visalia, Cal., W. H. Lipton.

Foreign

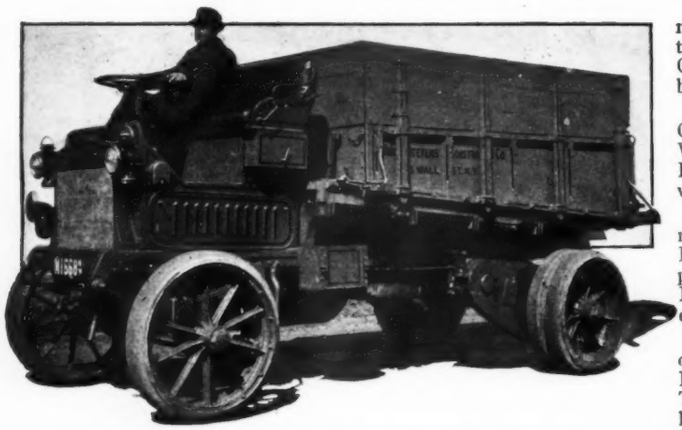
Nov.	2-3	Versailles, France, Splash Guard Competition.
Nov.	8-16	London, England, Olympia Automobile Show.
Dec.	7-22	Paris, France, Paris Automobile Show, Grand Palais.
Jan.	11-22	Brussels, Belgium, Annual Belgian Automobile Show, Centenary Palace.
April		Barcelona, Spain, International Exhibition.

Federal's Building Plans—The Federal Motors Company, Indianapolis, Ind., is preparing to erect a large plant in Indianapolis, the plans having been received. The plant will consist of a one-story building several hundred feet long, to cost $150,000, exclusive of machinery. The construction will be of brick and steel and of the saw-tooth type.

Denies Failure—The temporary shutting down of the Bowling Green Motor Car Company, Bowling Green, O., for the taking of an accurate inventory, gave rise to the rumor that the company has closed permanently. This is denied by the management, which declares that even when the inventory was being taken an emergency force was at work rushing out a car load of trucks for shipment to western concerns. The full force will start to work again in the near future.



Business is so good at the factory of the Baker Motor Vehicle Company, Cleveland, O., that some of the work of drilling and cleaning frames is done outdoors



First Locomobile truck built after the installation of the new special machinery and tools in the truck plant of the company at Bridgeport, Conn.

FIRST Locomobile Truck—The Locomobile Company of America, Bridgeport, Conn., recently sold a truck to John F. Stevens. This truck was the first of standard construction, that is to say, the first to be built after the special machinery and tools had been installed in the new truck shop at the works of the Locomobile company. The above illustration shows the truck ready for usage.

Enforcing Street Regulations—The Chief of Police, Montreal, Can., has received instructions from the Mayor to enforce new regulations regarding street traffic.

Winton in Stage Service—A sixteen passenger Winton has just been put in stage service over the Olympia-Chehalis-Tenino route in the state of Washington, a distance of 26 miles each day.

Jones Heads Ford—A. W. Jones has taken charge of the Houston, Tex., branch of the Ford Motor Car Company as manager. He was formerly assistant manager of the Ford branch at Seattle, Wash.

Woodruff with Packard—C. H. Woodruff has become publicity manager of the Buick Motor Company, Flint, Mich., he formerly being connected with the Packard Motor Car Company, Detroit, Mich., in a similar capacity.

Express Uses Trucks—Twelve motor trucks are to be put in service in New Orleans, La., by the Wells-Fargo Express Company within the next year, according to advises from the general offices to the local agent.

Evans Resigns from Lozier—J. M. Evans has resigned his position as advertising manager of the Lozier Motor Car Company, which position he held for a year. In the future, the Lozier advertising will be handled by an advertising agency.

Minneapolis Show Plans—Construction of the Armory annex for the February automobile show in Minneapolis, Minn., is proceeding so rapidly that the management of the show is assured the building will be ready complete for the exhibition.

Chesborox Business Sold—The Chesborox estate at the corner of Main and Windham streets, Willimantic, Conn., has been conveyed to Fred D. and William P. Jordan, and they acquire with it the automobile business of the E. P. Chesborox Company.

Canadian Company's Contract—It is announced by the Legare Gadbois Automobile Company, Ltd., Montreal, Can., that they have contracted with the Keeton Motors, Ltd., of Brantford, Ont., for the largest number of cars ever contracted for by a distributing firm in Canada.

Humphrey with Oakland—S. H. Humphrey, who was formerly connected with the Peerless Motor Car Company, has taken the position of factory manager of the Oakland Motor Car Company, Pontiac, Mich., to fill the vacancy occasioned by the accidental death of T. W. Wilson on September 15.

Detroit U. S. Motors Moves—The United Motors Detroit Company has removed its headquarters temporarily from Woodward and Charlotte avenues, Detroit, Mich., to the Brush plant, where service will be provided owners of Maxwell, Columbia, Courier, Brush and Stoddard-Dayton cars.

Austin with Mais—L. A. Austin, who has been the sales manager of the Western Motor Company and its successor, Rutenber Motor Company, Marion, Ind., for some years past, has resigned to become the sales manager of the Mais Motor Truck Company of Indianapolis, Ind. Mr. Austin will enter on his new duties November 1, 1912.

Timken Sales Conference—The quarterly sales conference of the Timken Roller Bearing Company and the Timken-Detroit Axle Company was held at Canton, O., October 15. The following Timken men attended: W. R. and H. H. Timken, Heman Ely, E. W. Lewis, P. W. Hood, P. W. Doyle, E. B. Lausier, H. J. Porter, C. E. Gordon and E. A. Walton.

No Duty Charged—It is expected that the new ruling by the United States credit department relating to automobilists crossing the Mexico and Canadian borders, the effect of which is that there shall be no duty charged on the cars, the only requirement being that the machines must be inspected, will result in a great increase in this class of travel into Mexico. The new ruling fixes 6 months as the time limit set on this free return of the cars into the United States.

Columbus Arranging Show—The Columbus Automobile Club, Columbus, O., is arranging to give an automobile show some time during the winter. To that end a committee consisting of Herbert A. Mason, Nelson J. Ruggles, Lewis M. Brown, Ira P. Madden, M. J. Hanly, Charles C. Janes and W. E. M. Ranchous is making preliminary arrangements. The place will be decided soon and the time fixed. It is believed the show will be soon after the holidays.

Garages' Good Outlook—One of the straws indicating to the wholesale automobile dealers and the branch managers that the outlook for automobile sales is good in the Northwest is the heavy contracting for new garages in Northwestern states. Weekly reports from architects, contractors and building exchanges show that the activity is heavy, and that in all the smaller cities not supplied with good central garages buildings are being remodeled for automobile purposes.

Steel Bodies Growing—If the plans which are now under way culminate, a $200,000 automobile body building concern will be located in Detroit, Mich. H. D. W. Mackaye, secretary to the president of the Keeton Motor Company, is negotiating with certain interests in the East regarding the contemplated venture. He stated recently that the eastern capital was willing to go ahead with it, the matter at present resting entirely with himself. The idea is to manufacture all-steel stamped bodies.

St. Louis Formulating Road Laws—Good roads enthusiasts from all parts of Missouri met at the headquarters of the Automobile Club of St. Louis, Mo., recently to formulate plans crystalizing the good roads enthusiasm which has been aroused, into some definite action. It was decided to call a mass meeting to be held in Jefferson City, on November 13, for the purpose of revising the road laws and to formulate effective road regulations which will be the means of giving Missouri the best roads of any state in the Union.

Columbus Plans Speedway—A special committee of the Columbus, O., Automobile Club is canvassing the situation as to the building of a motor speedway in Columbus. The committee consists of N. J. Ruggles, chairman, Lewis M. Brown and Dr. J. W. Means. To finance the undertaking a stock company will be formed and stock will be sold to motor enthusiasts in Columbus and central Ohio. It is proposed to have a speedway of either 1.5 mile or 2.5 miles. The committee will make a preliminary report soon.

New Agencies Established During the Week

PLEASURE CARS

Place	Car	Agent
Abie, Nebr.	Reo	Maseck Bros.
Albion, Nebr.	Reo	Point & Allen.
Ainsworth, Nebr.	Reo	M. L. Smith.
Amherst, Nebr.	Studebaker	G. Christofferson.
Arapahoe, Nebr.	Studebaker	A. Benjamin.
Arlington, Nebr.	Studebaker	J. C. Blackburn.
Blair, Nebr.	Studebaker	Warrick Auto. Co.
Buffalo, N. Y.	Apperson	Barrett M. C. Co.
Callaway, Nebr.	Studebaker	Corothers & Sherrel.
Chicago, Ill.	R-C-H	Barry Garage.
Columbus, O.	Cole	Franklin Cycle & Supply Co.
Columbus, O.	Jackson	Adamson Auto Co.
Columbus, O.	Lion	Brewer Auto Sales Co.
Columbus, Nebr.	Studebaker	Held Auto. Co.
Columbus, O.	Winton	E. J. Thornton.
Corning, N. Y.	R-C-H	M. Wolcott Gar.
Crete, Nebr.	Cartercar	Vaclov Sebek.
Des Moines, Ia.	Moon	Van Vliet-Bradt Motors Co.
Dewitt, Nebr.	Cartercar	O. W. Wiebel.
Dorchester, Nebr.	Cartercar	J. Freehoff.
Edgar, Nebr.	Studebaker	Edgar Auto Co.
Erwin, Ia.	Reo	Southall & Hanson.
Fairbury, Nebr.	Studebaker	Friessed Imp. Co.
Farragut, Ia.	Apperson	Palm & Cutler.
Fort Gaines, Ga.	R-C-H	W. W. Calhoun.
Grand Island, Nebr.	Reo	Jarvis & Boyder.
Green Bay, Wis.	Mitchell	Wash. Garage.
Green Bay, Wis.	Overland	Wash. Garage.
Haverhill, Mass.	Rambler	Haverhill M. C. Co.
Henderson, Nebr.	Studebaker	D. Goertzen.
Herman, Nebr.	Apperson	Olson Auto. Co.
Herman, Nebr.	Studebaker	Schrenk & McDonald.
Ithaca, Nebr.	Studebaker	J. Knapp.
Jonesville, Mich.	R-C-H	Grant S. Emery.
Kalamazoo, Mich.	R-C-H	Newton Root.
Kiron, Ia.	Lexington	A. Kastner.
Lima, O.	Oakland	Oakland Co.
Louisville, Ky.	Premier	Clark M. C. Co.
Massbach, Ill.	R-C-H	R. Dittmar.
Maxwell, Nebr.	Reo	O. P. Madsen.
McCool, Nebr.	Cartercar	Hebreck & Lincoln.
Milwaukee, Wis.	Crawford	F. O. Morse.
Minneapolis, Minn.	Havers	A. F. Chase & Co.
Montreal, Can.	Cartercar	E. Rivet.
Montreal, Can.	Cole	Royal Auto. Co.
Neligh, Nebr.	Reo	C. M. Cassidy.
Newberry, Mich.	R-C-H	Perry & Westin.
New Orleans, La.	Oakland	W. C. Gray.
Oakland, Nebr.	Studebaker	C. E. Anderson.
Palmerton, Pa.	R-C-H	K. W. Detwiller.
Providence, R. I.	Oldsmobile	Oldsmobile Co. of R. I.
Rockwood, Pa.	R-C-H	P. E. Weimer.
St. Louis, Mo.	Cole	Bagnell & Co.
Seattle, Wash.	Flanders	Oregon M. Dis. Co.
Seattle, Wash.	Rambler	Rambler M. C. Co.
Sidney, Nebr.	Reo	Livona & Son.
So. Omaha, Nebr.	Lexington	Holmes Atkins Co.
Stratton, Colo.	R-C-H	A. S. Baker & Son.
Summer, Nebr.	Maxwell	D. J. Yost.
Urbana, O.	Mitchell	Dallas McCrery, Jr.
Utica, Nebr.	Cartercar	P. S. Boone.
Valentine, Nebr.	Studebaker	G. S. Brown.
Wenango, Nebr.	Studebaker	C. M. Weyerds
Walnut, Ia.	Apperson	Cole & Hanson
Waterloo, Pa.	R-C-H	The Corn Belt Auto Co.
Wilber, Neb.	Maxwell	Kohout & Greer
Williamburg, Pa.	R-C-H	V. H. Hancuff & E. Shelly
Winnipeg, Can.	Cadillac	C. McLaughlin
York, Neb.	Cartercar	Mulick Mfg. Co.
Yutan, Neb.	Studebaker	J. W. Schlesinger
Zanesville, O.	Cadillac	Valley M. Co.

Louisville Purchases Truck—The Louisville, Ky., Board of Public Works will purchase a 5-ton truck in the near future. This vehicle is to be used for the hauling of broken rock and bricks to be used in the making of streets.

With Grinnell Electric—O. R. Hardwell has shifted from the position of advertising manager of the Paige-Detroit Motor Car Company to one of similar duties with the Grinnell Electric Car Company, Detroit, Mich.

Newby Traveling Representative—A position as special traveling representative, with territory in eastern Indiana, with the A. and M. Sales and Service Company, Indianapolis, Ind., has been taken by J. A. Newby, formerly manager of the United Motor Newcastle Company, at Newcastle, Ind.

License Tags Out Early—The first issue of Pennsylvania automobile license tags for 1913 will be made by the automobile division of the state highway department in December, almost two weeks ahead of the time of issue in the past, and it is expected to break all records for the first issue.

South Bend Forbids Speed—The Board of Public Safety of South Bend, Ind., has adopted resolutions forbidding the drivers of motor vehicles of the police and fire departments from driving their machines at a rate of speed greater than 30 miles an hour. The order of the board goes into effect immediately.

First Adams Fire Truck—The first automobile fire truck ever built by the Adams Brothers & Company, of Findlay, O., is just now being completed in the company's shops. It will be shipped within the next few days to Kittaning, Pa. The truck is of the one-and-a-half-ton model and has a 35-horsepower motor.

Employ Prison Labor—The Kent County Good Roads commission is planning to employ prison labor on the construction of roads in Grand Rapids, Mich. The plan successfully has been tried in Kalamazoo County. The commission is busy on the new roads for which the county recently bonded for $600,000.

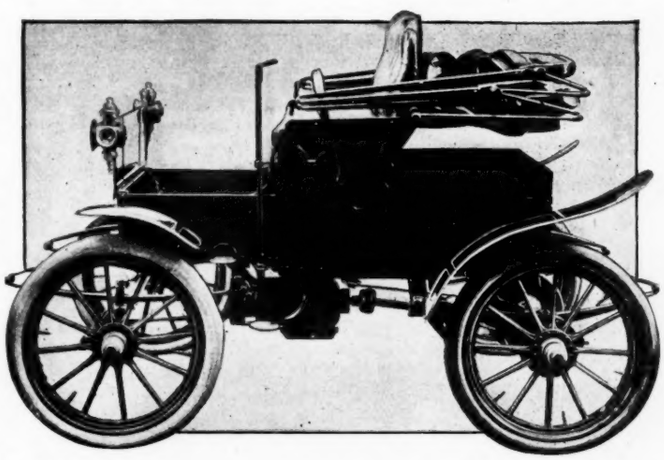
Abandon New By-Law—In consequence of an opinion from the city attorney, Montreal, Ont., that the new civic by-law prohibiting the use of steam driven traction engines in Montreal streets is ultra vires, Mayor Lavalle has given instructions to Chief Campeau to suspend further actions against those not complying with the said regulation.

Automobile Service Established—A daily automobile service has been established between Paducah and Roaring Springs, Tex., a distance of 40 miles. The Quanah, Acme & Pacific Railroad is now being extended from this place to Roaring Springs and the automobile service will be operated between the two points until the railroad is finished.

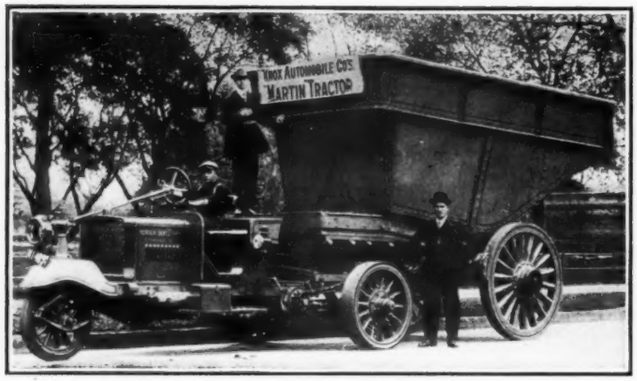
Motorists Give Talks—The Boston Y. M. C. A. directors have asked the Boston dealers to supply its motor school with men who can give talks to the students on motor construction during the winter, and the first talk was furnished by Charles Howell, of the J. H. MacAlman Company, agent for the Stearns and Columbia cars, who described the Knight motor.

Van Duesen Promoted—W. H. Van Duesen, assistant sales manager of the Abbott Motor Company, Detroit, Mich., and formerly connected with the Chalmers Motor Company and the E. R. Thomas Company, has tendered his resignation. O. F. Schreiber has been promoted to fill the vacancy in the Abbott sales organization. He was connected with the Chalmers Company at one time. M. L. Buck succeeds to Mr. Schreiber's former position.

Racine Wants Fire Engine—The city of Racine, Wis., which is in the market for a motor fire engine, is this week conducting a series of thorough tests, on the basis of which a purchase will be made. Among the companies which have sent models of their apparatus to Racine are the Nott Fire Engine Company, of Minneapolis, and the Ahrens-Fox Fire Engine Co., of Cincinnati, O. W. S. Goodland, mayor, and a party of officials, recently made a tour of the east to determine the efficiency of various types of motor-propelled fire-fighting equipment.



Shaft-driven electric runabout built by the Woods Motor Vehicle Company in 1904 which the company claims is the earliest model shaft-drive electric now in operation. The makers believe that it is the first vehicle of this type ever manufactured and sold in the United States. It took part in the parade of old models held by the Chicago Automobile Trade Association recently, running 12 miles and carrying two passengers



Martin tractor manufactured by Knox Automobile Company, Springfield, Mass., attached to a 15-ton capacity ash wagon, the combination being 12 feet high and 26 feet long

Buffalo Company Moves—The Buffalo, N. Y., Hudson Sales Company has moved into temporary quarters at 1133 Main street, opposite Summer street.

Kempton with Remy—P. E. Kempton, San Francisco, Cal., branch manager for the Splitdorf interests, has resigned to become San Francisco branch manager for the Remy Electric Company.

Building Branch House—The Fisk Rubber Company, of Chicopee Falls, Mass., is building a new branch house and service station adjoining its present quarters at 456 Milwaukee street, Milwaukee, Wis.

Orders Pathfinder Ambulances—An order for two Pathfinder ambulances has been placed with the Motor Car Manufacturing Company by the Board of Health and Charities of Indianapolis, Ind., the contract price being $5,500.

Y. M. C. A. Automobile Course—Arrangements have been made by which the South Bend, Ind., Young Men's Christian Association educational department will conduct an automobile course of 35 lessons, covering a period of 12 weeks.

Hold Lancaster Fair—Automobile dealers in Lancaster and Columbus, O., took advantage of the large crowds which invariably attend the Fairfield County fair and had large exhibits of automobiles at the fair, which was held the week ending October 5.

Bradfield Newspaper Representative—C. W. Sedwick, manager of the Indianapolis, Ind., Motor Speedway, has recently announced the appointment of H. C. Bradfield as traveling newspaper representative and chairman of the press committee of the speedway.

Warren's Factory Branch—The Warren Motor Company has announced the opening of a factory branch in Des Moines, Ia. R. E. Gresham will be manager of the branch. The service department will be featured and two experts from the Warren factory will be sent to Des Moines.

Sternberg Service Branch in N. Y.—The Sternberg Manufacturing Company, of Milwaukee, Wis., manufacturing the Sternberg commercial car, has established a direct factory and service branch at 285 East 137th street, New York. The New York branch will be known as the Sternberg Motor Truck Company.

Smith Succeeds Huylar—E. B. Huylar has resigned as manager of the Milwaukee, Wis., branch of the Diamond Rubber Company, 132 Oneida street, and is succeeded by R. W. Smith, who comes from Indianapolis, Ind. A. G. Laugher is traveling representative in Wisconsin, with headquarters at the Milwaukee branch.

Inspecting Repaired Road—State Highway Commissioner Marker has started on an inspection trip of the highways of Ohio which were improved during the present season. Commissioner Marker is using an automobile for that purpose, finding it quite a time saver over the use of railroads. It will require traveling 3,500 miles for a complete inspection trip.

Wilmington Club Elects—The Delaware Automobile Association, Wilmington, Del., held its annual meeting recently and elected the following officers for a year: President, T. Allen Hilles; first vice-president, Joseph Bancroft; second vice-president, A. B. Richardson; third vice-president, A. Greenbaum; secretary, Charles G. Guyer; treasurer, William Staniar.

Restrict Paris Operations—Announcement is made that the English Daimler Company will restrict its operations in Paris, France, at the end of this month. The central showrooms are to be closed and the headquarters of the English company confined to the repair departments in the suburbs. The retail sales department, in the hands of the various agents, remain unaffected.

In Financial Difficulties—An order in bankruptcy has just been filed by Leonce Girardot, for one time manager of the English Daimler Company in Paris, France, and earlier a member of the C. G. V. firm, now the Charron Company. For the past 12 months M. Girardot has been agent for Darracq valveless motors and the Panhard-Levassor Company, with a store in the Champs-Elysees.

Proposes Odd Ordinance—An ordinance is being prepared by Councilman Bohnert, of the Columbus, O., city council, which provides that the car of people charged with violating the speed law be locked up for a certain length of time as well as the chauffeur be jailed. Mr. Bohnert is of the opinion that locking the car up for a few hours or days in extreme cases will solve the problem of speeding.

Improves 4,700 Miles of Roads—Since the Pennsylvania state highway department took over 8,000 miles of highways in the state June 1, the department has improved 4,700 miles of roads. This total includes those that have been rebuilt under the 79 contracts so far let under the Sproul act and those that have been repaired by the road superintendents, 47 of which have been named out of 50 the law calls for.

Acme in Difficulties—William Vincent, president of the Acme Motor Car Company, 22 Commercial street, Worcester, Mass., has placed an attachment on the company's property for $1,200. He alleges that the company is indebted to him that amount for services. This is the second attachment placed on the garage stock, the first one being put on by the Worcester Trust Company. The company is still doing business despite its legal tangles.

In Doubt About Tax—A committee of the Automobile Club of Maryland, Baltimore, Md., was appointed to confer with Mayor Preston and the judges of the Appeal Tax Court to learn whether the proposed municipal tax on motor cars would apply to pleasure vehicles operating on the streets of Baltimore and whether the Mayor and City Council would have the power to impose such a tax without first being authorized by the Legislature.

Government Losing Money—Service Director Kinnear, of Columbus, O., is authority for the statement that the municipal government is losing money every day because of the few city automobiles used. He advocated the purchase of a larger number of cars in order to save the time of high-salaried employees. While it is said that some people laugh at the idea of the city buying automobiles, it is a plain business proposition and a matter of economy.

Automobile Incorporations

AUTOMOBILES AND PARTS

AUSTIN, TEX.—The Oakland Motor Company of Jersey City; capital, $10,000; to engage in the automobile business.

BOSTON, MASS.—Ultra Motor Car Company; capital, $100,000; to deal in automobiles. Incorporators: R. H. Randall, Elisha A. Bagg, C. A. Parker.

CANAL DOVER, O.—S. Toomey Company; capital, $50,000; to manufacture and deal in automobiles. Incorporators: R. I. Toomey, T. Williams, J. S. Brister.

CHICAGO, ILL.—Guaranty Auto Company; capital, $50,000; to manufacture automobile parts. Incorporators: J. T. Shea, E. J. Crimski, C. B. Kittenhofer.

COLUMBUS, O.—Columbus Auto Parts Company; capital, $25,000; to manufacture automobiles. Incorporators: R. E. Klages, C. J. Krag, C. K. Klages, J. D. Stoddart, W. D. McKinney

COLUMBUS, O.—Kelly-Springfield Motor Truck Company; capital, $2,500,000; to manufacture motor trucks. Incorporators: E. S. Kelly, J. S. Crowell.

DES MOINES, IA.—Van Vliet-Bradt Motors Company; capital, $10,000; to deal in automobiles. Incorporators: W. E. Moyer, W. J. Bradt, C. G. Van Vliet.

DETROIT, MICH.—Oostdyke Gear Shifting Company; capital, $100,000; to manufacture a gear shifting device which does away with shifting levers on the car.

HAVERHILL, MASS.—Rambler Motor Car Company; capital, $10,000; to sell automobiles. Incorporators: G. A. Burnham, J. P. Molloy, C. S. Goodwin, F. P. Kimball.

HOLDEN, MASS.—J. W. McIntosh Company; to engage in the automobile business. Incorporators: J. W. McIntosh, B. M. Sickels, H. Sickels.

HOUSTON, TEX.—Cole Motor Car Company; capital, $12,500; to deal in automobiles. Incorporators: J. J. Settgast, Fr., A. J. Binz, T. H. Buelow, D. F. Burks.

LOUISVILLE, KY.—Southern Motors Company; capital, $100,000; to deal in motor cars. Incorporators: A. T. Hert, R. A. Whitehead, R. L. McCormick.

Waite Sales Manager—G. S. Waite has taken the position of sales manager of the W. A. Paterson Company, Flint, Mich.

Muzzy Garage Manager—W. W. Muzzy is the new manager of the High-Seventh Garage, located at High street and Seventh avenue, Columbus, O.

Lawrence a Ford Manager—The Ford Motor Company of Canada, Walkerville, Ont., announces the engagement of A. N. Lawrence as sales manager.

Establish Tire Branch—The United States Tire Company, Washington, D. C., will establish a branch at 1303 H street, N. W., about November 1, with E. H. Johansen as manager.

Morrison Gets Promotion—Harry S. Morrison, formerly a salesman for the Whitney-Barney Company, of Boston, Mass., has been promoted to be general sales manager of the company.

Butler District Manager—W. T. Butler has been appointed by the Stewart Motor Corporation, Buffalo, N. Y., manager for the district comprising northern Pennsylvania and New York State.

Lights on Standing Cars—Hereafter all automobiles left standing in the streets at night throughout Connecticut must have lights lit, the attorney-general having rendered an opinion to that effect.

Club Rewards Twenty—The Louisville, Ky., Automobile Club has paid a total of twenty rewards this summer to persons who assisted in the conviction of offenders who threw glass into the streets.

Car for Inspector—In order to facilitate the enforcement of the sanitary regulations Shreveport, La., has purchased an automobile which will carry an officer throughout the city each day on inspection trips.

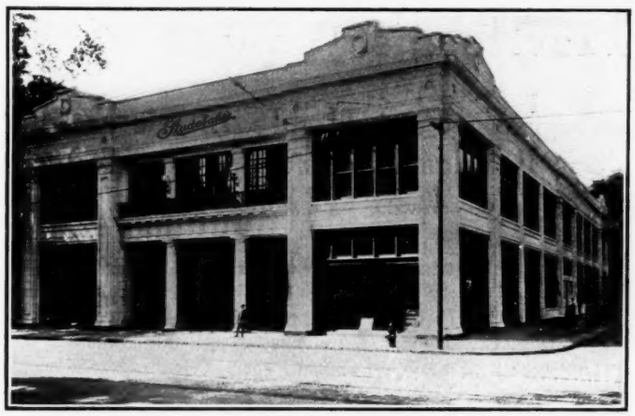
Depasse Takes R. C. H. Agency—After being chief selling agent for the Ford Company for about five years, Henri Depasse has taken up the complete selling agency for the R. C. H. car in Paris, France.

Open Washington Agency—The Washington, D. C., branch of the Foss-Hughes Company, agent for the Pierce-Arrow, was opened recently at 1220 Connecticut avenue, N. W., with F. N. Prendergast as manager.

Clement Production Manager—C. M. Clement has become production manager of the Metal Products Company, Detroit, Mich., having resigned as factory manager of the Weston-Mott Company, of Flint, Mich.

To Hold Sociability—The Louisville, Ky., Automobile Club will conduct a sociability run on November 9. The intention is to make a trip to Lexington. Awards will be made to the car making the run nearest to a secret time.

Buy U. S. Motors Branch—Frederick J. Linz and L. W. Sanborn, two of the pioneer automobile men of San Francisco, Cal., have purchased the entire assets and capital stock of the United States Motor San Francisco Company.



In this building in Detroit, Mich., the Studebaker Corporation has organized a model garage, salesroom and repair shop which is used for the purpose of educating its dealers and representatives all over the country

Packard Service Building—The new building being constructed by the Packard Motor Car Company in Buffalo, N. Y., will provide for a salesroom, general offices and a service station with facilities for inspection and overhauling.

Packard Moves in Paris—Business having increased in favorable proportions, R. N. Goode, European manager of the Packard Motor Car Company, Paris, France, has moved from Boulevard Pereire to a handsome store in the Rue Newton.

Dennett Handles Trucks—George Dennett has been appointed manager of the truck department of the newly formed Pope-Hartford agency in Boston, Mass. He was with the Dodge Company handling trucks and fire wagons for some years.

Sociability to York—The Lancaster Motor Club, Lancaster, Pa., will hold a sociability run to York, Pa., on Saturday, October 26, and will be the guests of the York Motor Club at the races being held there that day and at the York club's new home along the Wrightsville pike.

Association In Maine—The Somerset, Me., Automobile Association, the first one formed in that county, has just been organized in the Pine Tree state, making its headquarters at Skowhegan. It will work in conjunction with the Maine State Association for the benefit of good roads.

New Dallas Motordrome—The new $40,000 motordrome at Dallas, Tex., was officially opened recently. Racing programs are being given each night. This motordrome is said to be the largest in the world. The track is an 18-foot saucer, .25 mile in length. Seats are provided for 10,000 people.

Takes Three Cars Per Week—The D. F. Poyer Company, manufacturing the Menominee commercial car, Menominee, Mich., has contracted with the Stoddard-Dayton Automobile Company, of Portland, Ore., to be Pacific coast distributor. The Portland company takes three cars per week on a 1 year's contract.

Chauffeurs Fight Speedometers—A proposal on the part of taxicab owners in New Orleans, La., to equip their cars with recording speedometers has met with decided opposition on the part of the chauffeurs. No reason is given for the stand taken, but it is thought an attempt to install the device would result in a strike.

Good Roads Day—The germ of good highways is penetrating all over America, the latest example being up in New Brunswick when the motorists in that region got together and observed October 12 as Good Roads Day. Members of motor clubs went out over the most important roads there putting up signs and making repairs where a little work of that kind was needed.

Preaches in Automobile—His own chauffeur, and in cases of necessity his own organist, Archdeacon J. H. Dodshon, of the southern diocese of Ohio, Episcopal church, has been performing his duties through the mining region of southern Ohio with his automobile, equipped with a portable organ. The novelty of a large touring car bearing an organ entering a little mining village that never boasted a church has been productive of much good and the Columbus man's coming always draws an interested audience.

Automobile Incorporations

GARAGES AND ACCESSORIES

ACTON, MASS.—Davis-King Company; capital, $20,000; to deal in automobile accessories. Incorporators: A. W. Davis, H. E. Mead, B. A. King.

AMHERST, MASS.—H. E. Page; capital, $12,000; to conduct a garage business. Incorporator: Dr. Henry E. Page.

BOSTON, MASS.—Walpole Tire and Rubber Company; capital, $4,500,000; to manufacture automobile tires. Incorporators: E. W. Tinkham, A. T. Baldwin, F. J. Gleason, E. C. Green, E. W. Furbush, L. O. Duclos, J. C. Blanchard, Jr.

CHICAGO, ILL.—Triangle Tire Company; capital, $50,000; to manufacture automobile accessories. Incorporators: L. A. Cohen, C. Aaron, F. M. Stahl.

COLUMBUS, O.—J. C. Sherwood Rubber Company; to handle the tire business. Incorporators: J. C. Sherwood, R. C. Crippen.

CLEVELAND, O.—The Ideal Tool & Specialty Company; capital, $15,000; to manufacture automobile accessories. Incorporators: J. C. McLoland, G. E. Penty, G. P. Moulton, J. A. Hocker, C. Fuller.

DAYTON, O.—McVey Manufacturing Company; capital, $60,000; to manufacture automobile accessories: Incorporators: J. L. McVey, C. Fraine, A. N. Burkhart, M. Galloway, R. J. McCar.

DETROIT, MICH.—The Wolverine Castings Company; capital, $100,000; to manufacture motor castings.

PORTLAND, ORE.—Motor Truck Owners' Protective Association; capital, none; to secure legislation favorable to their interest and fight unfavorable, legislation. Incorporators: K. Poorman, W. M. Miller, C. L. Hamawalt, J. F. Guerin, P. W. Yett, F. P. Field, W. E. Moon, A. F. Roberts, J. J. Bryan, W. Eden, W. C. Smith, O. J. Cornell, H. F. Moon.

TACOMA, WASH.—Automobile Equipment Company; capital, $5,000; to deal in accessories.

WINNIPEG, CAN.—Canadian Motor Company, limited; capital, $500,000; to carry on a garage business. Incorporators: E. S. Sherwood.

CHANGES OF NAME AND CAPITAL

BOSTON, MASS.—American Marine Equipment Company, change of name to American Motor Equipment Company.

CLEVELAND, O.—The Auto Owners Company, change of name to the Sixth City Tire Repair Company.

Hartford's New Bumper

Comprising Four Highly Elastic Springs in Frictional Contact and Attached To Chassis Without Bolts

AS a trade running-mate to its Truffault-Hartford shock-absorber, the Hartford Suspension Company, of Jersey City, N. J., has decided to add to its line a kindred article, this being a bumper. The latter not only combines the friction idea with the application of springs, but a new element designed to warrant great strength is introduced in the use of concrete as a filler for the hollow steel bumper bar used in the equipment.

The simple, fundamental feature of the Hartford bumper lies in the use of four springs which are in frictional engagement with each other and the ends of which bear directly upon the chassis frame, being attached to the same without the use of bolts which pierce the members and so arranged that none but tensile and compressive strains are set up in the material, thereby avoiding all tendency to shearing.

The four-spring idea is carried out in all types of the bumper, of which there are three; these are designed for use on overslung, underslung and Ford cars. The bumpers of these types vary in the shape of the springs and the consequent manner of securing the same to the chassis, while the concrete-filled bumper bar is common to all models. Reference to Figs. 5, 6 and 7 shows the difference in spring design and attachment of the three types, Fig. 7 showing the principal representative of the line, which is constructed for use on ordinary type of frame, the overslung, so to speak.

Construction of Spring Bumper

In Figs. 3 and 4 the details of construction of this type of bumper are illustrated, showing the four bent leaf-springs S1, S2, S3 and S4, which when the spring is assembled are held together by a bolt B and its nut N. In the assembly the bolt passes through the hole H of the arched cap or cover C which is so dimensioned that the flat end of the longest, or clamp, spring S4 projects slightly under the plane of the lower edge of the cover. As Fig. 4 shows, S4 is so shaped that if its shorter end contacts with S3, its longer or clamp-shaped end diverges from S3. The purpose of this feature of the design will be seen at once. The spring ends arranged above the clamped end of S4 are held together by means of U-bolt U which seats in a yoke Y. A central stud C1 formed in the lower side of the yoke fits into a hole bored in the spring S1 near its end. The lower cross-piece connecting the ends of the U-bolt bears in the inverted angle formed in the clamped end of S4. As the nuts on the end of U are drawn tight, as in Fig. 3, S4 is pressed against S3 and its natural shape keeping it under tension counteracts the compression caused by the tightening of the bolts. While S4 is held tightly in this way and the springs are so brought together that they cannot be moved relatively to each other except by overcoming friction between them, the clamped end of S4 is drawn tightly around the bumper bar which fits into it. To secure the spring to the chassis, in the manner shown in Fig. 7, the U-bolt or clamp U1 is used which fits into a slot S5 of the cover C. When the nuts on the ends of U1 are tightened to press the cross-piece above them against the chassis members, the end P and the point Q of the spring S4 bear down fast upon chassis, and the more they are compressed the more do the central portions of the four springs, shown along the line C2, press against the top of the arched cover C. This makes an almost rigid system of the shorter ends of the four springs, while the longer ends are capable of considerable inward bending—toward their middle angle—accompanied by friction which absorbs a fair part of the impact of a shock taken by the bar.

When such a one takes place a double action is set up by the bumper: the impact transmitted from the bar to the two spring assemblies is partly absorbed by bending the longer spring ends toward the shorter and partly by being transmitted to the strong chassis members from the arched, covered section of the spring system. The slightest impact on the bumper causes the end of S4 to grip the surface of the chassis, the spring being made of steel harder than the pressed metal of the frame. Continued and increased shock compresses the short spring ends toward their arched centers, whereby a straight upward pull is set up in the U-bolt U1. While the grip of S4 on the frame prevents the springs from slipping, it also provides a fulcrum for the longer ends to bend about, and as they do this, the friction between their surfaces as well as the change of their shape absorbs the impact. The diameter of the holes through which the bolt B passes is slightly larger than that of the bolt, so that a slight displacement of the springs relative to each other is allowed for.

How the Springs Are Shaped

As the shape of the springs is obviously of great importance, it may not be without interest to consider the process through which they are formed. The springs are made of flat plates, are cut in various lengths and each is bored with a hole near each end; so that when the ends which later form the short ones are lined up, the holes punched near them are in alignment and the springs may be held together by a pin. The holes near the other ends do not fall upon each other, but after the first-mentioned ends are pinned together, the four flat springs are heated to redness and bent, in a special tool, to form the middle angle, whereby the holes which are to accommodate the bolt B are brought above one another. The pin is then removed and the short ends are bent to the degree shown in the illustrations, as well as the long ends of S4 which is given its clamped shape. After shaping the springs are tempered and assembled with the cover, bolts and nuts, which are made of cold-rolled machine steel; this work is followed by dipping the assembled sets into black japan, which is then baked on.

The underslung type of bumper equipment differs from the first-described type only in the shape of the springs which grip

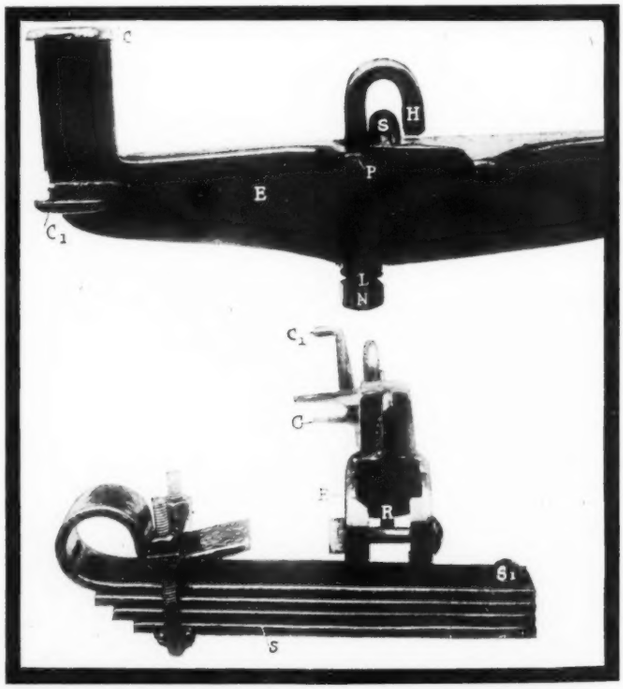


Fig. 1—Details of extension for attaching bumper to Fords
Fig. 2—Springs and extension of Ford type of spring bumper

the under surface of the chassis frame members. As a result of the different requirements the springs in this design are shaped as a flat arch, instead of with a middle, angular bend. The spring ends are formed substantially in the same manner as in the overslung equipment, and the action is the same in both models. The springs when receiving a shock press the lower end of the clamp spring against the chassis member, whereby a fulcrum is provided as before. Instead of bending around a middle angle, however, the springs are pressed around the front end of the chassis member. The springs are tempered to withstand a very heavy shock without distortion; but if the latter is occasioned in consequence of an exceptionally severe collision, the springs may be easily restored to their original shape and strength. A set of springs used with a bumper of a 1,250-pound car which ran into a tree when traveling at 15 miles an hour, showed a comparatively slight distortion, which was the only effect of the accident, neither car nor its passengers or equipment being hurt. As for the concrete-filled bumper bar, it is claimed to be capable of withstanding any practical shock.

Description of the Ford Type

Coming to the third type of bumper, which serves for Ford cars, the manner of meeting the special requirements of such service is shown in Fig. 5, illustrating the method of attaching the springs by extension members to the side members of the frame, while the details of the construction are seen in Figs. 1 and 2. The extension members E, Fig. 5, are used due to the design of the Ford frame which only extends as far in front as the radiator; by this expedient the bumper bar is placed far enough ahead of the radiator and lamps to protect them, at the same time leaving ample clearance for cranking. The general shape of the extension member E, shown in Fig. 5, makes it desirable to use four straight springs, instead of bent ones, with the Ford design, and to make this possible an ingenious method of securing the springs to the extensions has been evolved.

Figs. 1 and 2 illustrate the same. The latter illustration shows the flat springs, one of which is clamped at its end to take in the bumper bar in the same fashion as the other types of the equipment. The other end of the clamped spring is shaped with a projection having the form of a truncated cone; this end of the spring set fits into the open end E1 of the extension E. In Fig. 2 both extension and springs are shown with the lower side turned up. When assembled on the car, however, the spring set is so inserted into the end E1 of the extension that the lower surface S of the shortest spring bears against the lug R formed on the extension, which prevents the springs from bending back too far upon being exposed to an impact. Lateral tightness of the spring set in the extension is insured by the expedient of drawing the nut M a good way into its bolt which passes through the two jaws of the end E1. Displacement in the direction opposite to that of a head-on shock is averted by the fitting of the stud S1 into a suitably formed depression in E1. The securing of the extensions to the cars is also obtained in an original fashion and without the use of bolts through the chassis frame. A grip on the frame is insured by the end of E opposite E1, which end is formed with channel jaws C, C1, C gripping the upper and C1 the lower flange of the chassis frame. In order to permit of the channeled end of the extension E gripping the chassis frame, the apron extending from the mudguard to the frame is punched with a suitable tool. This end, however, is not directly fixed to the frame, the point of attachment being at A, where the extension is fitted with a hook-bolt H adapted to be drawn tight against the stud S by a nut N and its lock-washer L. In installing the bumper the hook-bolt is placed over the bracket extending from the frame and supporting the lamps, so that when the ends E1 are placed as far outward as possible the extension E is fulcrumed by the hook-bolt and the channeled end is pressed against the chassis frame. The part P formed on E lies against the front of the radiator support and helps to keep the extension permanently in alignment with the chassis.

Overslung and underslung types are made in three sizes, while the Ford equipment come in one size only. Black japan finish is standard for all parts except the bumper bar, which is optional in brass or nickel.

Fig. 3—Springs which fasten to chassis and hold the bar
Fig. 4—Details of bumper springs, arched cover and bolts

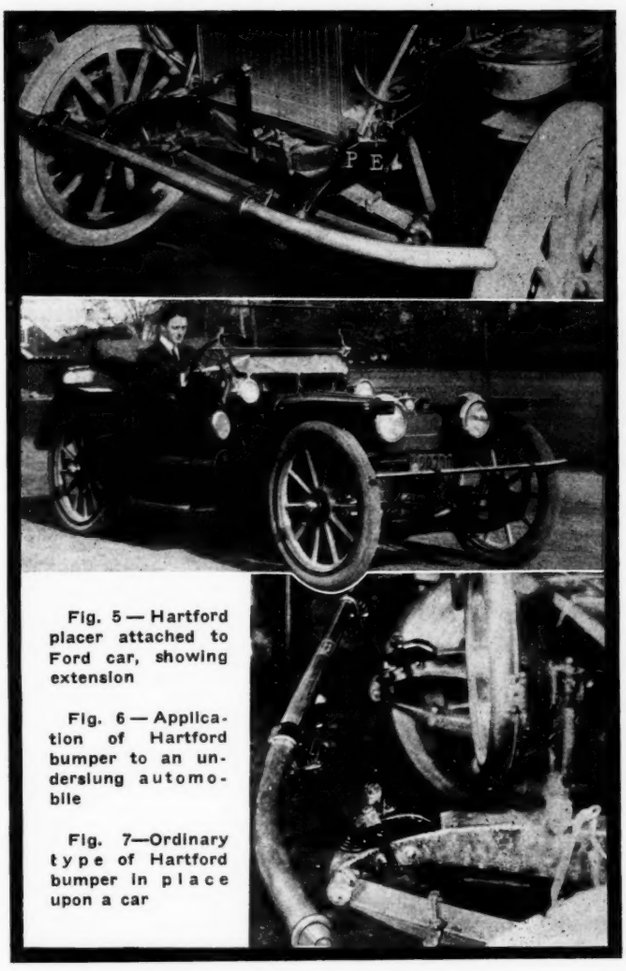
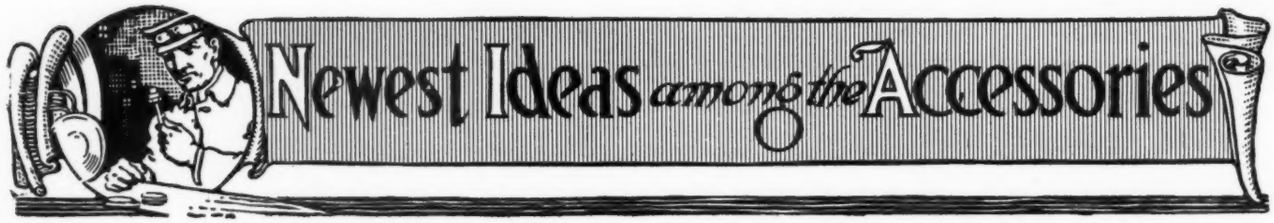


Fig. 5 — Hartford placer attached to Ford car, showing extension

Fig. 6 — Application of Hartford bumper to an underslung automobile

Fig. 7—Ordinary type of Hartford bumper in place upon a car



Mertz Spring Release; Standard Tire-Tube Ball Check; Edelmann Hose Connection; Marvel Casing and Tube Vulcanizer; Exhaust-Operated Vacuum Cleaner; Westinghouse Portable Electric Vulcanizer

Mertz Valve Spring Release

A PRACTICAL, neat valve spring release, made by H. B. Mertz, 1408 Rutherford avenue, Pittsburgh, Pa., is shown in Fig. 1. While the construction is evidently simple, the device is made strong enough to compress any automobile-valve spring. It consists of a vertical bar B to whose lower end an arm carrying the fork F is secured, while slidably arranged on it is the arm A; the end of the latter is formed as a nut N working on the worm W which is fitted with a handle H. The point of the worm W fits into the central depression of the valve head. In order to keep the fork centered on the valve stem, F is provided with an adjustable gauge G which, once set, always keeps the stem in central alignment with the axis of the fork. The operation of the device is very simple, consisting in removing the valve cover and applying the fork between the retaining washer R and the pin P which keeps it from coming off the stem. At the same time the end of the worm W is set into the depression of the valve head and if the handle H of the worm is turned clockwise the retaining washer and spring are pressed upward, permitting of driving the pin P out of the valve stem, so that the valve may be lifted out of its seat.

The arm A being slidable on B and capable of coming off its upper end, it is possible to use the spring release also where this would seem impossible due to the interference of the manifold with direct application of the device. In such cases, the arm A is simply slid off the upper end of the vertical bar; after this the bar is placed back of the manifold and A is put back on it. This makes the tool adaptable for practically any type of valve.

Potter Standard Tire Valve

Taking advantage of the field for improvement in tire valves, the Standard Engineering Works, Woonsocket, R. I., offers now a design which is claimed to be a step in the forward direction and which while keeping the air tightly locked in the tube permits of easy inflation without a continued expenditure of hard work in keeping the valve open. As Fig. 3 shows, the valve is of the ball check type, and it is claimed for this design that it allows of pumping up a 36 by 4.5-inch tire within 2 minutes with one hand. This end is obtained by the expedient of using an opening area about ten times that ordinarily present in tire valves, whereby not only the pump pressure on the valve ball is increased, but the total friction between the inflating air and the valve passage is considerably diminished. In connection with this valve, the company brings out an automatic valve connection, the Standard, Fig. 2. It is of an extremely neat design and worked out very nicely, its construction being such that the valve connection may be put in place in 2 seconds and removed in 1 second.

Marvel Roadside Vulcanizer

Tire upkeep proves such a large item to the average automobilist that one cannot too often attempt to impress upon him the desirability of owning and operating a vulcanizer, even if it only be a small one, so that he may at least handle his smaller tire repairs. Among the many products which have of late appeared in the market to fill this want, the Marvel, Fig. 5, is distinguished by its applicability to both casings and tubes. Furthermore, the vulcanizer is so small it may be easily carried along with the other tools, and its simple construction makes it ready for work at a moment's notice. In short, the device con-

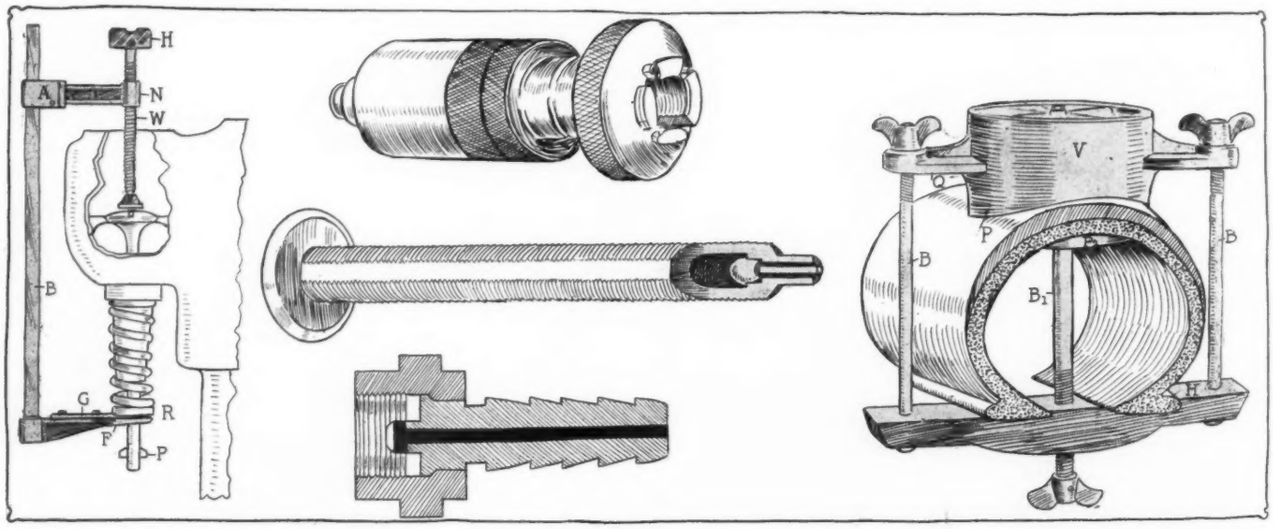


Fig. 1—Mertz spring release. Fig. 2—Potter tire valve connection. Fig. 3—Potter valve. Fig. 4—Edelmann pump connection. Fig. 5—Marvel vulcanizer

sists of two vulcanizing plates P and P1, the first of which is curved concavely and the second convexly. These plates are held in relation by the use of a holding plate H to which P is fixed by two bolts B, while the plate P1 is attached through the bolt B1. Bolts B are screw-threaded near their upper ends and work in threads in the plate Q which is integral with the vulcanizing heater V, while a thread on B1 works through plate H. The heater V is a small kettle into which gasoline is poured which when ignited supplies to plate P the heat necessary to cure the rubber applied to the tire being repaired. It stands to reason that the vulcanizer is just as easily applicable to tubes as to casings, as the curved surfaces of plates P and P1 do not interfere with the repairing of the tubes. This vulcanizer is made by the National Auto Specialty Manufacturing Company, Inc., Tama, Ia.

Edelmann Economy Pump Connection

E. Edelmann & Company, 229 West Illinois street, Chicago, have added another small accessory to their line, this being the Economy pump connection No. 45, Fig. 4. The latter is somewhat similar in design to the No. 46 connection, but it is a cheaper product, being made of but two parts, the nut taking in the pipe and hose carrier which is of serrated longitudinal section, as shown by the illustration. The connection is designed for .3125-inch hose and .25-inch pipe thread. This pump connection is being handled in the Metropolitan district by Asch & Company, 1777 Broadway, New York City, dealers in automobile accessories and specialties.

Auto Vacuum Cleaner

A vacuum cleaner for keeping the automobile free from dust without any hard work is an accessory which has many attractions, and realizing this situation the Auto Vacuum Cleaner Company, 253 West Twenty-third street, New York, has begun the construction of a suitable outfit, shown in Figs. 7 and 8. The suction, which represents the effective force in vacuum cleaning, is in this device obtained by utilizing the pressure of the exhaust gases of the engine, and efficient use is made of it through the application of a suction nozzle inserted in the line between the engine and the muffler, where the pressure in the waste gases is strongest. The manner of installation is clearly seen in Fig. 7, and Fig. 8 illustrates the details of the construction. The passage M is interposed in the exhaust line; it is designed as a T and the middle piece contains a throttle-valve by the use of which the lower T-piece may be cut off from the exhaust line. The piece T is fitted with the part N containing the nozzle, the capacity of which is regulated by an adjusting screw S. By means of the fitting F the dust-conducting tubing is attached to the pipe P; its other end carries the brush-nozzle B or the upholstering tool U. When the engine is running and the throttle V open, the air is sucked out of the tubing, being followed by new air through the brush-nozzle or the tool U, which at the same time carries along the dust being taken off the car body surface.

Westinghouse Electric Vulcanizer

Electric vulcanizers of the portable type are equally applicable in garage work as on high-class automobiles, and the latest type of this tool has been announced by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. This vulcanizer comprises a heating plate with a curved surface for casing repairs and a flat one for the vulcanizing of tubes, a fifteen-step rheostat and thermometer for regulating the temperature produced in the heating plate and attachment straps, current being drawn from any 100-125-volt circuit by a standard plug. A flexible connecting cord, 15 feet in length, is included in the equipment. The heat is produced in a metal ribbon which is embedded in mica and hermetically sealed in the heater plate, thereby being shielded from contact with air. The vulcanizer normally consumed from 150 to 175 watts for the repairing of a 36 by 4-inch casing, or about 1.5 amperes on a 110-volt circuit.

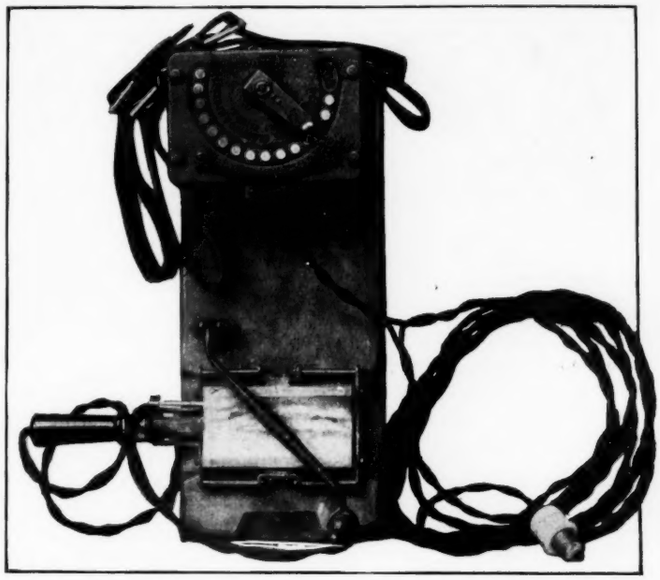


Fig. 6—Westinghouse electric portable vulcanizer for car and garage

About 20 minutes are required to complete the repair. One of the principal points in the operation of the vulcanizer is to keep the temperature at 275 degrees before starting the repair and to keep it there until the work is done. The rheostat with its thermometer permits of easy control of this factor.

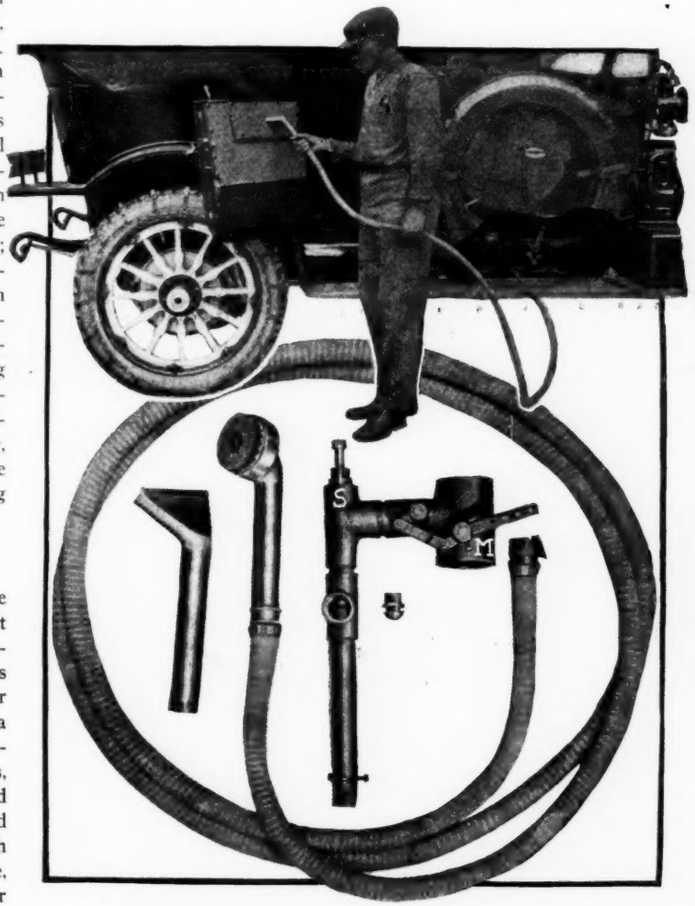


Fig. 7—Vacuum cleaner operated by the exhaust. Fig. 8—Parts of cleaner

AUTOMOBILE Top Construction—Utilizing links so made that the mechanism may be operated quickly and with ease.

The top described in this patent, Fig. 1, comprises two main forward and rearward bows, F and R respectively, which are spaced when the top is open. The lower end of R is attached to the end of a bar, B, whose other end is so pivoted at the car body that the bar points rearwardly. The front bow F is fitted at its lower end with means M for attaching it to the body, and with means M1 for securing it to the rear bow R when the top is closed. Braces B1 and B2 keep the extremities of the top material under tension, while its middle section is taut between the upper end of F and R. To close the top, B is turned through an angle of 180 degrees and B2 is dropped along the path shown by the dotted line; after this the top may be folded back and F be attached to R by engaging M1.

No. 1,041,571—to Clarence L. Bair, San Francisco, Cal. Granted October 15, 1912; filed September 20, 1910.

Wheel-Hub and Shock-Absorber—Springs surrounding bolts which bear against bosses on the axle serve as shock absorbers.

Fig. 2 shows the subject matter of this patent. A pair of spaced bosses B carried by the axle end extend into the annular depression A of a circular plate P. A central depression C opens in the opposite direction, relative to A, and from its center extends a stub axle. A pair of bolts B connect the opposite sides of the annular depression and pass through the bosses, being surrounded by springs S which are interposed between A and one side of each boss. A hub mounted on the stub axle enters C, which is surrounded by a circular extension of the hub. The hub supports a tread surface and the plane of the tread is in line with the centers of the bolts.

No. 1,041,097—to Charles L. Kennedy, Winnipeg, Can. Granted October 15, 1912; filed March 27, 1912.

Driving Gear for Electric Cars—Comprising a suspension for the motor and a worm drive between its shaft and axle.

This patent has reference to a drive for electric vehicles, illustrated in Fig. 3. A suspension S is mounted on an axis parallel to the vehicle axle, so as to be able to rock on the body. The motor M is mounted transversely to this axis; a bearing is mounted to rock on the axle A and is attached to the motor casing, and a shaft S is journaled in the bearing. This shaft has a driving connection with the motor and the axle. The above-mentioned suspension is ring-shaped and is fitted with oppositely arranged trunnions. A groove in the motor casing receives the suspension, and bearings depending from the body support the trunnions.

No. 1,041,450—to William Henry Douglas, Belleville, N. Y. Granted October 15, 1912; filed May 18, 1910.

Two-Cycle Combustion Motor—In which a valve box containing three chambers regulates the distribution of fuel.

The patent refers to a two-cycle construction, Fig. 4, comprising cylinders C, the lower ends of which are connected to an air compression chamber A. Each cylinder is water-jacketed at W, the water being charged into the jacket at a point near the bottom of the cylinder casting. A valve box communicating with the chamber A through the passage P regulates the mixture of fuel and air as well as the admission of the mixture to the cylinder. The box is divided into three chambers—V1, V2 and V3. The central chamber, V1, communicates with A. The upper chamber, V3, communicates with the lower one, V1, which in turn communicates with the combustion chamber when the piston is near its outer dead center. Fuel is fed to V2, and a valve operated by compressed air simultaneously admits air to V3 and fuel to V2.

No. 1,041,154—to Leon Palous, Berlin, Germany. Granted October 15, 1912; filed December 26, 1911.

Pneumatic Tire Construction—Comprising a triple rim, through whose use tread and tube are kept separate.

The tire construction referred to in this patent consists of three rims, an inflatable tube and a solid tread. An inner rim, R1, is concentric with the wheel, and a floating rim, R2, to which a rim, R3, is concentrically fastened, surrounds it, being held in place by the inflated air chamber A. An expansible security band S is held by radial bolts B to the intermediate rim R2, which is kept concentric with R3 by two annular clamping plates C. Bolts pass transversely through the plates C to hold them in place. A tread band T is mounted permanently on the outer rim R3.

No. 1,041,350—to Eugene Richard Riedinger, London, Eng. Granted October 15, 1912; filed July 2, 1912.

Making Tire Cores—Process for the manufacture of a filler for automobile tires.

This patent refers to the making of a tire, consisting in shaping a mixture of crude rubber, sulphur and a gas generator in ring form, wrapping it tightly with tape so that it may fit the core mold. The ring is then placed in the mold and vulcanized; in this way a core of sponge rubber is produced in the tight-fitting envelope.

No. 1,041,377—to Ira F. Trautman, New York City. Granted October 15, 1912; filed October 25, 1911.

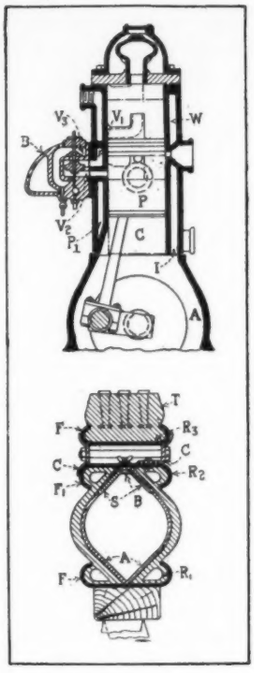


Fig. 4—Palous motor
Fig. 5—Riedinger tire

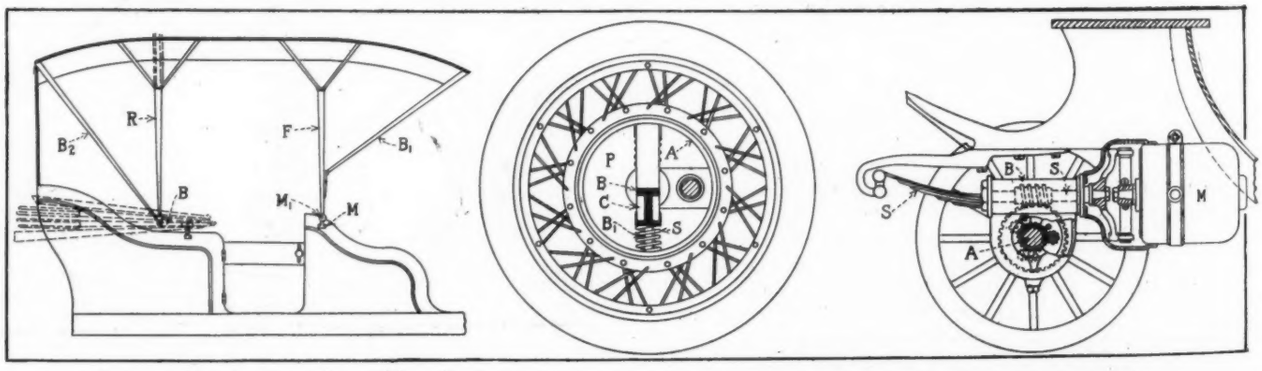


Fig. 1—Bair automobile top. Fig. 2—Kennedy shock-absorbing wheel. Fig. 3—Douglas drive gear for electrics